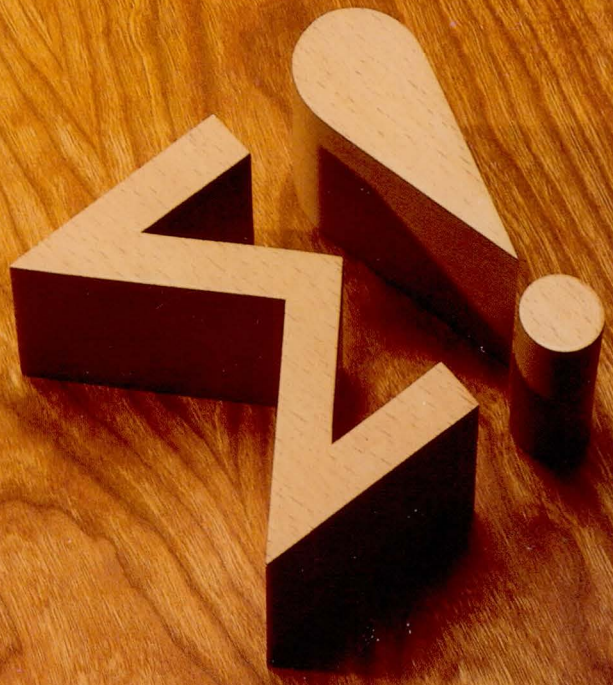
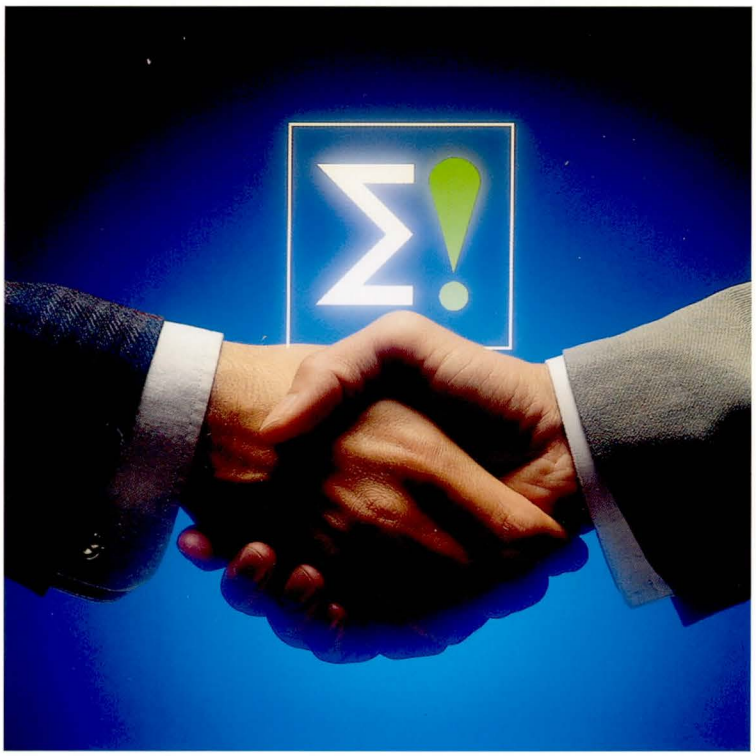
EUREKA
ANNUAL PROGRESS REPORT
1994



INTRODUCTION
EUREKA: AN INNOVATIVE TOOL



Launched in 1985, EUREKA has proven a successful tool in strengthening European competitiveness and improving the quality of life.

This report provides a general picture of EUREKA's project portfolio as of 15 October 1994. The more than 650 running projects covered in this report have a total estimated cost of around 11.5 billion ECU and involve some 3500 participants, over 1500 of which are large companies, more than 800 small and medium sized companies, over 1000 research institutes including universities and about 200 other organisations.

The report also gives a statistica overview of the more than 200 EUREKA projects which have already finished. The cost of thes projects is estimated at 3 billion ECU, bringing the total cost of ongoing and finished projects t over 14.5 billion ECU. Furthermore, the report contains descri tions of 11 successfully finished projects which describe some actual results and experiences c European research & development work under the EUREKA Initiative.

EUREKA: an Open Initiative

"Bottom up" is EUREKA's groun rule. Participants have full respor sibility for defining and implementing their technological cooperation projects. This "bottom-up" principle ensures that a EUREKA projects are motivated by sound commercial and techn logical interests.

EUREKA's structure is built to mobilise the dynamism and inn vative strength in Europe's indu try and research. The ground ru prevents unnecessary bureaucra and provides a simple set of criteria for establishing EUREKA projects. The most important of these criteria require the project to

- involve at least two partners from different EUREKA members,
- focus on technological innovation,
- aim at a marketable product, process or service,
- be oriented towards applicatio in the civilian sector.

Any company or research institute in a EUREKA member country, which has a proposal meeting the EUREKA project criteria is invited to contact the relevant National Project Coordinator (NPC) listed on pages 24-25 of this report. The application procedure to establish or join a EUREKA project is very simple and is constructed in such a way that a well founded project can be up and running relatively quickly.

In most of the Central and Eastern European countries a network of EUREKA National Information Points (NIPs) has been set up to provide industry and research institutes in these countries with an easy interface to EUREKA and facilitate participation of their industry and research organisations in EUREKA projects. The NIP addresses are listed on page 26 of this report. In recent years some Central and Eastern European countries have already joined the Initiative. Hungary became a member in 1992, followed by the Russian Federation in 1993 and the Republic of Slovenia in 1994. This brings the total number of EUREKA Members to 23.

EUREKA: a Flexible and Decentralised Structure

At the end of 1994 the EUREKA Initiative included Austria, Belgium, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Russia, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom and the European Union. The Chairmanship of EUREKA rotates on a yearly basis between the Members.

National Project Coordinators
The NPCs are the operational core of the network. They run the national EUREKA offices and form the interface between project participants and the EUREKA network. They are in close contact with the relevant national funding authorities as well as with their counterparts in the other EUREKA countries. The NPCs can assist participants in their search for additional partners and offer help in the actual setting up of a project.

EUREKA Secretariat
The Secretariat is EUREKA's central support unit located in Brussels. It gathers and distributes information on projects and EUREKA as such, runs the project database, assists the various bodies of the Initiative and promotes the EUREKA concept in conjunction with national authorities. An overview of its publications and information on the EUREKA database are given on page 27 of this report.

High Level Group
This body is made up of High Representatives appointed by their national governments and the Commission of the European Union. It formulates general EUREKA policy for approval by the Ministerial Conference and generally meets four or five times a year. The HLG also endorses new EUREKA projects.

Ministerial Conference
The Ministerial Conference is the political body of EUREKA. It is composed of Ministers from the 22 member countries and a Commissioner from the European Commission. It meets, as a rule, once a year to lay down the political guidelines and officially announces the new EUREKA projects launched since its previous meeting.

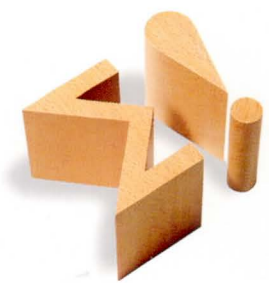
EUREKA: Added Value

EUREKA projects and participants are eligible to carry the EUREKA Seal - an internationally recognised hallmark of excellence. Experience shows that the EUREKA label contributes positively to success in the market place.

EUREKA projects also have, in many cases, access to public financial backing from their national governments and the European Union, although the participants themselves are responsible for securing adequate funding.

Participants are included in EUREKA's project database, which lists by name and technological skills some 4000 of Europe's foremost companies and research institutes. Various national and European publications, as well as the participation at fairs and conferences, are only some of the tools used to promote EUREKA projects. As such, a EUREKA participant is marketed all over Europe and is likely to attract attention and contacts from partners searching for specific technological skills to develop new products, processes or services.

Furthermore, EUREKA offers its projects various kinds of support in a wide variety of areas such as standardisation, contracts, venture capital etc.



EUREKA IN 1994

Throughout 1994, EUREKA organised several Brokerage Events and conferences, often in coordination or together with the European Commission. The first Brokerage Event was "Transport Technology '94" in Zeist (the Netherlands), where transport industrialists and infrastructure operators swapped information on plans and expectations for transport technology, demand and services through the next decade. Several projects were initiated as a result.

Two more Brokerage Events took place in Eastern Europe. Sustainable Technologies for Efficient Energy Production was co-organised in Budapest by EUREKA, the European Commission and the World Industry Council for the Environment. It centred on energy efficient technologies and integrating energy technology into eco-efficient solutions, and provided participants with a Europe-wide overview of investment plans in energy production technologies and updated briefings and advice.

The other Eastern European Brokerage Event concentrated on a country, rather than a technological area. The Polish Brokerage Event, held in Warsaw, focused on developing new ventures with active Polish involvement, and included workshops which focused on Polish R&D opportunities in Environment, Energy and Biotechnology. Two projects with Polish participation have so far emerged from this event.

Two further Brokerage Events - EUROAGRI '94 (Paris) and Diagnostics and Biotechnology (Edinburgh, UK) - were also held to stimulate interest in two very different application areas of biotechnology.

EUREKA also co-organised the "International Workshop on Advanced Materials for Lightweight Structures '94" in Noordwijk (the Netherlands) with the European Commission and the European Space Agency, and attended major trade fairs. These included presentations of EUREKA umbrellas - with stands representing EUROMAR at Oceanology International '94 (Brighton, United Kingdom) and OCEANS/-OSATES '94 (Brest, France), FAMOS at Hannover Messe and EUREKA projects in the area of aeronautics at ILA '94 (Berlin) - and general stands promoting EUREKA at CeBIT'94 (Hanover), the European Polymer Federation Symposium in Basel and the European Commission's conference on industrial technologies in Brussels.

Olympic Quality at Lillehammer

The largest EUREKA Event of the year, however, took place alongside the Ministerial Conference in Lillehammer, Norway, from June 13-17. 'Vision EUREKA' brought together over 2,000 European researchers and industrialists in 17 conferences to explore technological issues and future markets in areas as diverse as environmental management and food processing. Many conferences featured Brokerage Events, organised to help participants discuss possible collaborative arrangements in depth.

The 144 new projects announced at the 1994 Ministerial Conference are worth an estimated investment of 900 MECU, and include a record percentage of SMEs. Another 90 projects were finished, doubling the number of projects which have reached the market and clearly demonstrating that the substantial investment built up through EUREKA is paying dividends.

Slovenia's entry into the EUREKA family at the Ministerial Conference was another prominent event in Lillehammer. There was also a major exhibition of Russian technologies, including Russian contributions to 13 EUREKA projects.

The Ministerial Conference also presented the first Lillehammer Award, which recognises a finished EUREKA project for both its technological and economic results and practical environmental benefits. The 1994 winner was EU 160 - FERMSEP, a French-Italian collaboration which developed a new generation of 'ultrafiltration' mineral membranes to make many dangerous organic solvents and additives currently used by the pharmaceutical and food industries unnecessary.

The Norwegian capital also hosted the 5th Interparliamentary EUREKA Conference in March.

MESSAGE FROM MR JEAN-PASCAL DELAMURAZ, SWISS MINISTER OF PUBLIC ECONOMY

Mr Jean-Pascal DELAMURAZ, Swiss Minister of Public Economy

Switzerland attaches great importance to its Chairmanship year in EUREKA. This Initiative allows Switzerland to assume responsibility within a Europe-wide cooperative venture. The task which was assigned to us by the Ministerial Conference in Lillehammer is important, and we are determined to prove equal to the challenge. Our responsibility is particularly great as EUREKA is now entering its tenth year - a time for assessment and reflection.

In view of the considerable growth of EUREKA's membership in the nine years of its life and also of the number of projects enjoying EUREKA status, one of the key tasks for our Chairmanship is to examine the structures and working methods of the Initiative in order to determine whether certain adjustments prove to be necessary.

But we must tread carefully. Indeed, Switzerland has chosen continuity to be the motto for its Chair. None of the basic principles and values of EUREKA will be jeopardised. In particular, the "bottom-up" approach which has already proved to be very successful will not be affected by any changes that may be made.

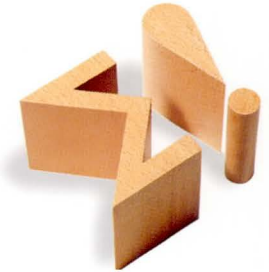
The desire for continuity will also be reflected in further work on the analysis of EUREKA projects. This year, the action will be concentrated on already completed projects. Its results will establish the commercial implications of the EUREKA project and its impact on European industry. The exercise will help participants to choose the best orientation for their projects and define the most effective strategies. It will also contribute to the marketing of EUREKA by highlighting the positive results of the Initiative.

The analysis and stimulation of participation in EUREKA projects from the countries of Central and Eastern Europe represent another key point in the work programme of our Chairmanship which is to support the economic integration of these countries. This includes several meetings which the Chair has organized specifically for these countries.

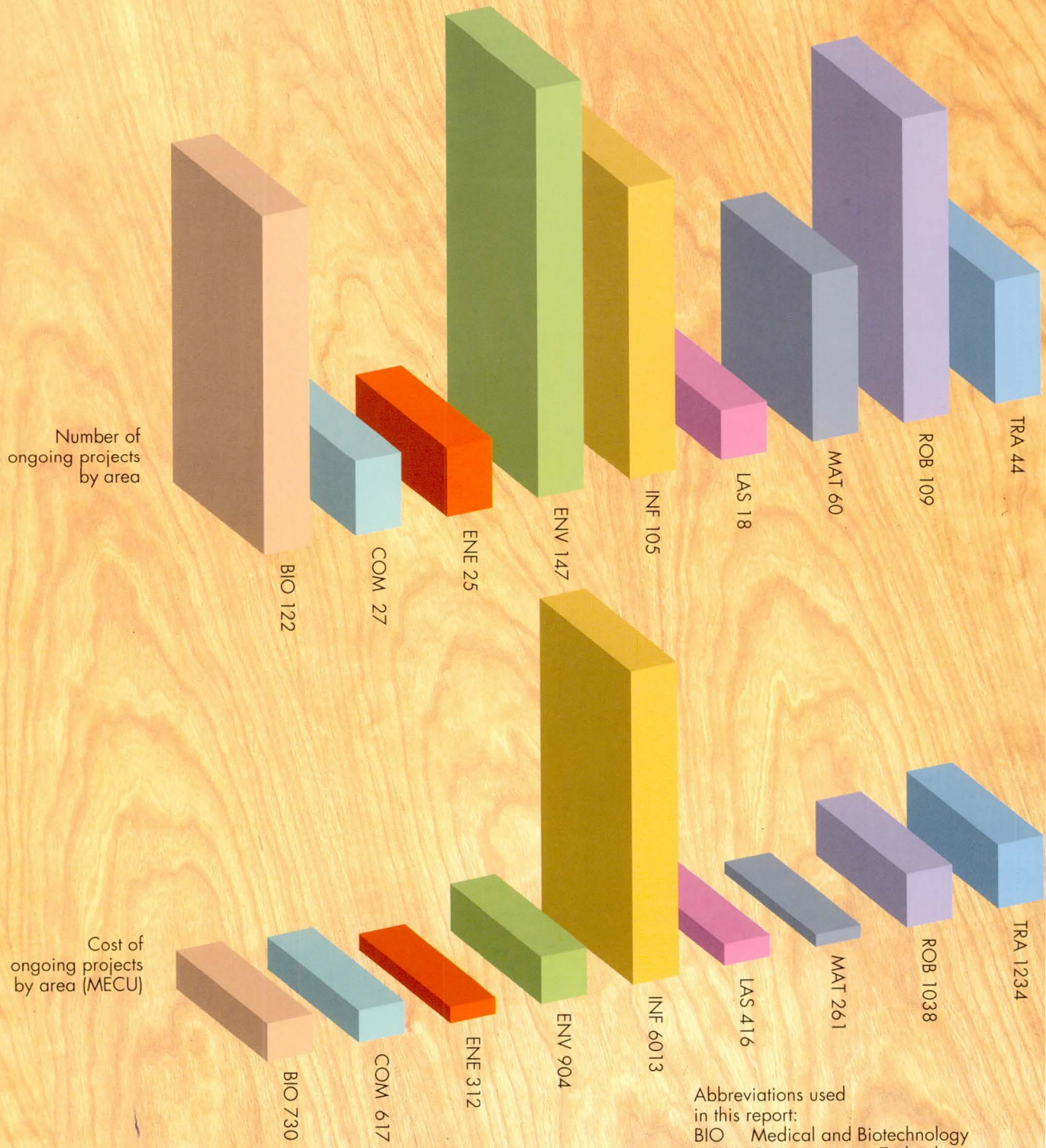
The element of continuity is also present in the will of the Swiss Chair to support small and medium-sized enterprises (SMEs), which are the main participants in EUREKA projects. This support aims, for example, at facilitating SMEs' access to private-sector financing, as they are the principal source of new product development, new working methods and, of course, new jobs.

And, last but not least, the environment, Norway's priority theme, culminating in the creation of the Lillehammer Award, is in no danger of being neglected by Switzerland, a country whose geographical location and topography present major challenges for environmental protection. The organisation of industrial fora, particularly in the field of transport, bears witness to our determination to deal with this subject from a practical point of view.

The responsibilities facing our country during its year in the Chair are many and varied. Switzerland takes its mission to heart. This year in the Chair is an opportunity for us to show that Switzerland is very much a part of cooperative ventures having a European dimension.



STATISTICS



Abbreviations used in this report:

BIO	Medical and Biotechnology
COM	Communication Technology
ENE	Energy Technology
ENV	Environment Technology
INF	Information Technology
LAS	Laser Technology
MAT	Material Technology
ROB	Robotics and Production Automation
TRA	Transport Technology

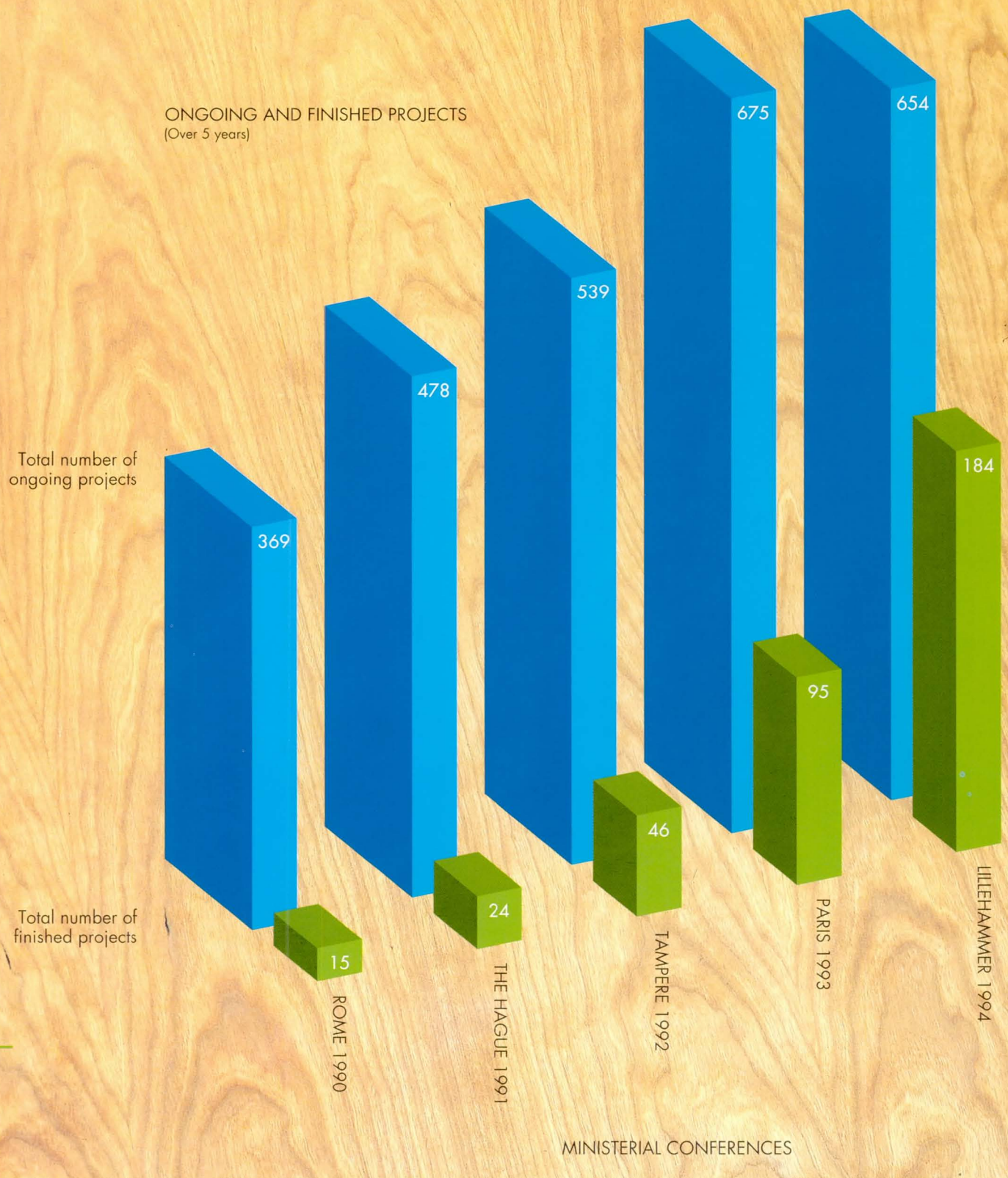
Source of data in this report:
EUREKA database as at 15 October 1994

STATISTICS

MEMBERS AND ORGANISATIONS IN ONGOING PROJECTS

Number of projects	Member	Number of organisations					
		Industry	of which SME	Research	of which University	Others	Total
75	Ⓐ Austria	73	29	30	16	9	112
73	Ⓑ Belgium	71	34	28	21	3	102
13	ⒺⓊ European Union	–	–	4	–	3	7
85	ⒸⒽ Switzerland	80	47	51	22	7	138
210	Ⓓ Germany	318	104	193	101	19	530
86	ⒹⓀ Denmark	64	31	22	8	7	93
138	Ⓔ Spain	151	65	64	29	11	226
259	Ⓕ France	463	172	162	52	24	649
88	ⒻⒾⓃ Finland	107	47	25	9	6	138
24	ⒼⓇ Greece	24	10	17	13	1	42
25	Ⓗ Hungary	18	10	17	5	3	38
130	Ⓘ Italy	183	34	97	55	7	287
12	ⒾⓇⓁ Ireland	7	3	7	7	1	15
4	ⒾⓈ Iceland	6	6	1	0	1	8
3	Ⓛ Luxembourg	2	2	0	0	1	3
80	Ⓝ Norway	105	46	31	4	14	150
185	ⓃⓁ Netherlands	218	93	65	36	12	295
48	Ⓟ Portugal	29	8	29	12	14	72
16	ⓇⓊⓈ Russia	7	5	14	0	0	21
138	Ⓢ Sweden	131	66	38	14	13	182
6	ⓈⓁⓄ Slovenia	2	0	7	3	1	10
7	ⓉⓇ Turkey	5	1	6	4	0	11
174	ⓊⓀ United Kingdom	261	77	105	70	30	396
20	Non-member countries	8	1	11	4	1	20
	Total	2333	891	1024	483	188	3545

STATISTICS

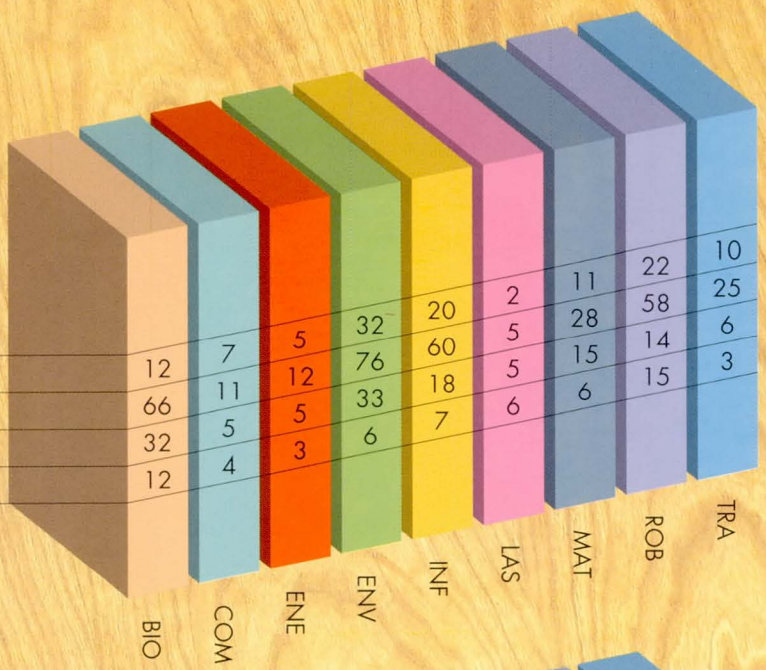

ONGOING AND FINISHED PROJECTS
(Over 5 years)
Total number of ongoing projects
Total number of finished projects
369
15
478
24
539
46
675
95
654
184
ROME 1990
THE HAGUE 1991
TAMPERE 1992
PARIS 1993
LILLEHAMMER 1994
MINISTERIAL CONFERENCES

STATISTICS

PLANNED PROJECT DURATION

Number of ongoing projects by area

Project Duration (PD) in Months	Total
PD ≤ 24	121
24 < PD ≤ 48	341
48 < PD ≤ 72	133
PD > 72	62



FINANCIAL SIZE OF PROJECTS

Number of ongoing projects by area

Project Cost (PC) in MECU	Total
PC ≤ 1	133
1 < PC ≤ 3	172
3 < PC ≤ 5	92
5 < PC ≤ 10	117
10 < PC ≤ 20	59
20 < PC ≤ 40	46
PC > 40	38

EUREKA TECHNOLOGICAL AREAS

EUREKA projects are classified into 9 technological areas. The largest area in terms of number of projects is Environment Technology, closely followed by Medical and Biotechnology and Robotics and Production Automation. However, in terms of value of projects, the area covering Information Technology is by far the largest. The highest growth was again established in the area of Environment Technology, with the announcement of 29 new Environment projects by the Ministerial Conference in Lillehammer, June 1994.

Medical and Biotechnology

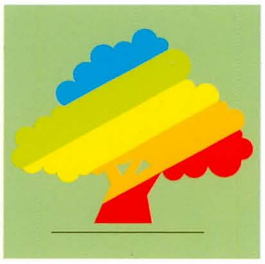
This area encompasses 122 ongoing projects and 28 finished projects. Major themes are medical technologies (vaccines, diagnostics and surgical aids), agro biotechnology, foodprocessing, genetic engineering of plants, biotechnological processes and animal breeding.

Communication Technology

Within the Communication area, 27 projects are underway, while 12 projects have already finished. The projects focus on communication networks, equipment and various applications in radio, telephone, television and computing.

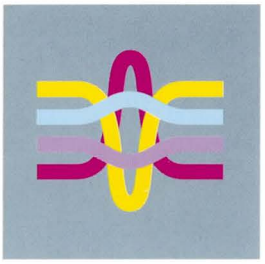
Energy Technology

This area shows 25 ongoing projects and 10 finished projects. It includes projects active in energy production as well as in the rational use of energy. The energy production projects focus both on fossile and renewable energies, such as solar, biomass and wind energy.



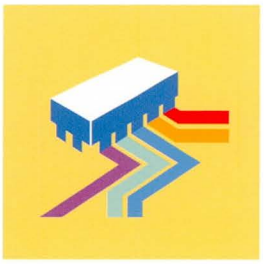
Environment Technology

The Environment area encompasses 147 ongoing projects and 29 finished projects. These projects focus on the marine environment, atmospheric research, terrestrial environment (including clean production technologies and waste management), cultural heritage and environmental monitoring.



Material Technology

The Material Technology area contains 60 ongoing and 21 finished projects. Most of these projects focus on new materials, advanced applications (e.g. in automotive, construction, off-shore, etc.), fabrication processes, design codes and testing.



Information Technology

The Information Technology area has 105 ongoing projects and 34 finished projects. Major themes are computer hardware (including integrated circuits, processors and peripherals), computer software and a wide range of application projects in linguistics, healthcare, navigation, manufacturing, etc.

Robotics and Production Automation

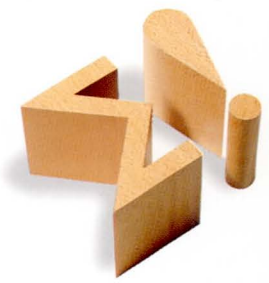
This area encompasses 109 ongoing projects and 48 finished projects. Most of the projects deal with advanced manufacturing systems and factory automation in different applications. Other topics addressed are the development of enabling technologies such as robots, sensors and software.

Laser Technology

Within the Laser area, 18 projects are underway, while 4 projects have finished. This area includes projects which focus on the development of high power laser systems, industrial laser applications and laser safety for industrial as well as medical applications.

Transport Technology

Within the Transport area 44 projects are ongoing, while 16 have finished. Transport projects cover the whole field of road and inland water transport, rail, air and sea transport and integration between the different transport modes.

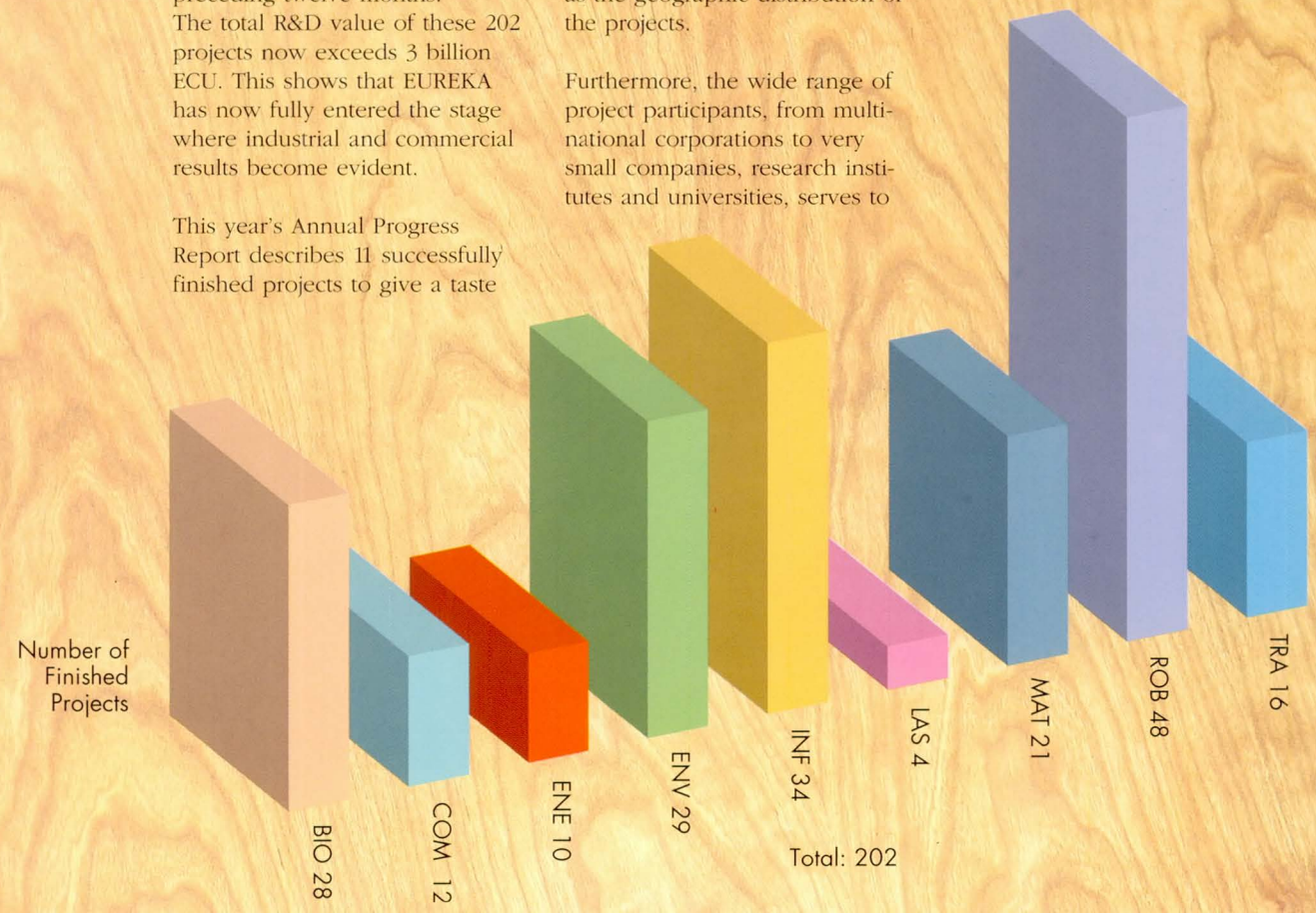


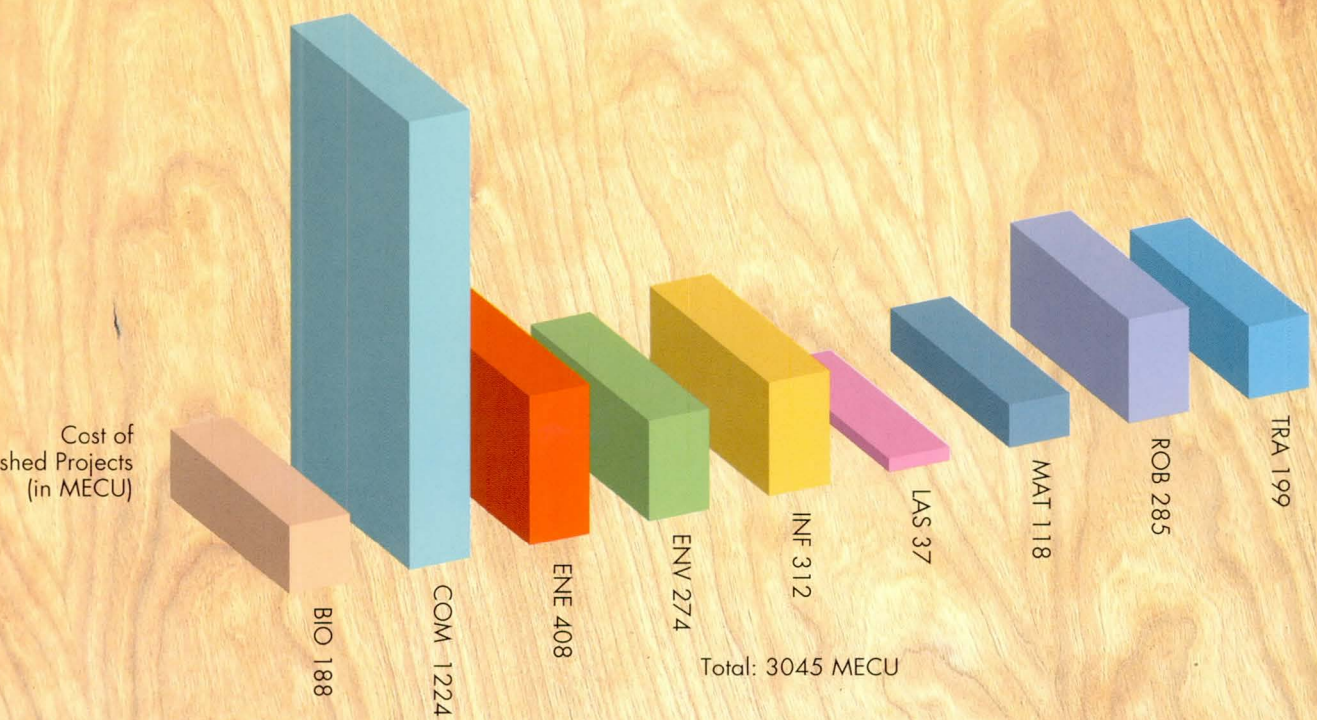
FINISHED PROJECTS

The real fruits of the EUREKA Initiative are successfully finished projects. By October 1994, there were 202 such projects, of which 89 were completed during the preceding twelve months.
The total R&D value of these 202 projects now exceeds 3 billion ECU. This shows that EUREKA has now fully entered the stage where industrial and commercial results become evident.

This year's Annual Progress Report describes 11 successfully finished projects to give a taste of the wide variety of products, processess and services developed by EUREKA projects. This variety is reflected in the technological span of the projects as well as the geographic distribution of the projects.

Furthermore, the wide range of project participants, from multinational corporations to very small companies, research institutes and universities, serves to show that EUREKA really is effective as a catalyst in making European industry and science work together to improve European competitiveness.





EU 104

INDUSTRIAL-SCALE CELL CULTURES

For many years research scientists have produced antibodies using cultures of hybridoma cells - a fusion of a lymphocyte, which manufactures the antibodies, and a myeloma cell. The resulting antibodies are currently useful for diagnostic tests and targeting treatments to specific parts of the body.

The equipment which houses the cell culture, providing it with physical support, nutrients and oxygen, is commonly known as a bioreactor. A standard membrane bioreactor consists of a cylindrical bundle of hollow fibres, between which lie the cells. The 'medium', containing nutrients and oxygen, flows through the fibres. It permeates through the fibre walls to reach and nourish the cells, and also carries away the proteins for extraction.

The problem with this architecture is that it is very difficult to scale up - increasing the size of the bundle beyond a certain limit is not possible, as the pressure driving the medium through the bundle becomes too uneven, causing cells to die out in the central section. When industrial-scale cell production takes off in the next few years, particularly for applications such as bone-marrow transplants, these systems will not be very suitable. As a result of the CELLSYS project, however, a new, patented product now looks set to capture a large proportion of this potentially enormous market.

The CELLSYS bioreactor is already playing a key role in Inceltech's new range of equipment.

Patented Products

The key result of the project is a new, flat bioreactor design. The medium flows up from below, passing through a filter and percolating throughout a flat compartment containing the cells. This compartment also contains a set of fibres, arranged in several planes, which supply oxygen. The medium flows out the top of the compartment through another filter, loaded with the excreted products.

The flat configuration of the new bioreactor allows it to be scaled up in size by a factor of 100.

In this way the medium reaches all parts of the cell culture at the same pressure, allowing the equipment to be scaled from 15 ml to 1.5 litres in volume.

The CELLSYS design was patented worldwide by the leading partner, French company Bertin & Cie, in 1989. It is now a key component in a new product line recently launched by Inceltech SGI, a partner specifically brought into the project in 1991 to commercialise the results. The other industrial partners were Immuno (Austria) and Sorin Biomedica (Italy), who validated the technology for antibody production, and French filter supplier Tech-Sep (also a partner in EU 160 - FERMSEP, the winner of the 1994 EUREKA Lillehammer Award).

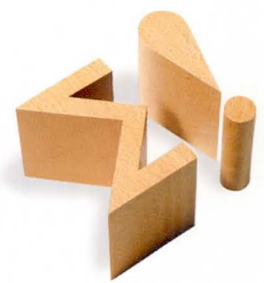
Acronym: CELLSYS

Title:
Mass Production Using Animal Cell Cultures as a Starting Material

Participants:
Austria:
Immuno
France:
Bertin & Cie / Inceltech /- INSERM / LSGC / Tech-Sep
Italy:
Sorin Biomedica

Main Contact:
Mrs Isabelle Geahel
Bertin & Cie
Tel: +33 1 34 81 85 80
Fax: +33 1 30 54 04 14

Project completed in:
May 1993



Acronym:
EUROLASER-LASWORK

Title:
Laser Workstation for Surface Treatment

Participants:
Italy:
Ansaldo Industria / ENEA / Istituto per le Ricerche di Tecnologia Meccanica e per Automazione / Prima Industrie
Germany:
Bremer Institut für Angewandte Strahltechnik / Krupp / Rofin-Sinar Laser

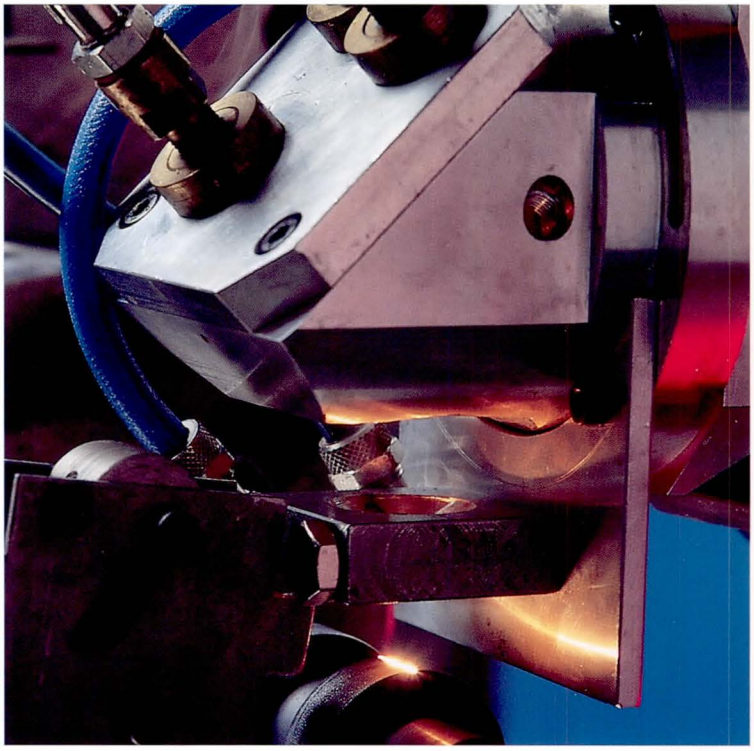
Main Contact:
Maichi Cantello
Istituto per le Ricerche di Tecnologia Meccanica e per Automazione
Tel: +39 125 747 25
Fax: +39 125 747 55

Project completed in:
July 1993

EU 204

FOCUSING ON LASER SURFACE TREATMENT

Metal surfaces have been hardened by rapid heating and cooling since the Iron Age. It is still an essential step in many mechanical engineering industries, particularly aerospace, vehicle and energy system manufacturers.
Heating the component with lasers, rather than with the traditional furnace, offers many benefits. When the EUROLASER-LASWORK project was launched in 1987, however, European industry was far from ready to adopt the technology. By focusing the project on industrial needs, the private partners had new systems on the market by the time it finished in 1993.



Hardening specific component surfaces using a prototype laser at the Istituto per le Ricerche di Tecnologia Meccanica e per Automazione in Italy.

Laser Workstation: On the Market

LASWORK brought together private research institutes, laser system SMEs and large industrial companies from Italy and Germany to develop and integrate the optics, lasers, sensors, software and basic knowledge required to take laser-based surface treatment from the laboratory to industry.

The technology shows great potential where only small areas of a component - such as cutting edges and sliding surfaces - require hardening. A major advantage is that laser treatment does not risk thermally distorting the entire component, which can happen with traditional techniques. In addition, laser-based treatments can be carried out on the production line, substantially improving manufacturing efficiency.

The project resulted in prototype workstations in both the Italian and German research institutes, a new range of lasers adapted for surface treatment from laser supplier Rofin-Sinar Laser and a new 5-axis laser robot from system supplier Prima Industrie.

The latter product - the 'Rapido' laser workstation - integrates more established cutting and welding laser technologies with the new surface treatment techniques developed in LASWORK. In this way it provides the users with both unparalleled flexibility and improved productivity. Prima have already built over 100 Rapido systems - making them one of the market leaders - and are currently selling 10-15 systems a year worldwide. Rofin-Sinar Laser, who supply Prima, are also considered one of the market leaders in the field as a result of the project.

Lastly, the research institutes are now providing manufacturers with 'job shop' services, demonstrating the new systems' advantages in order to promote the uptake of this competitive new technology throughout Europe.

The 'Rapido' laser workstation integrates the results of the EUROLASER-LASWORK project into a multipurpose manufacturing tool. Photo: Prima Industrie, Italy

EU 259

WELDING WISDOM ON TAP

In many manufacturing industries, the knowledge and experience of the welding engineer is crucial. There are many types of weld, so finding the right technique for the job at hand can save money and raise quality and productivity.

However welding engineers are in extremely short supply, posing particularly acute problems for SMEs. As a result of EU 259 - EUROWELD, software packages are now on the market which can provide this rapidly disappearing expertise from shopfloor computer systems.

The Right Knowledge at the Right Time

Welding, like many engineering disciplines, is as much an art as a science, so the British, Danish, Dutch, Norwegian, Swedish and Swiss partners concentrated on expert systems which can handle 'fuzzy', or imprecise rules.

The main participants in each country were companies devoted to welding technology and software. These partners were in turn sponsored by national manufacturers with a strong interest in welding, giving a strong market orientation to the project.

Each partner worked on one or more different software packages, but developed them according to common standards developed in the first phase of the project.
The results include a database of welding procedures, conventional calculation programmes and 12 expert systems covering different aspects of welding procedures such as fatigue design, joint preparation, welding parameters and quality control.

The systems present information in different ways for different users, using both text and graphics.
In this way the information they provide is tailored to the differing needs of engineers, designers and quality control staff, so that the company extracts maximum benefit.

Because the modules were developed using specially tailored standards, the different modules can be integrated together to form EUROWELD, a Welding Engineering Information System. This is still in prototype form, but the various partners have already sold hundreds of distinct, standalone modules, while the industrial users are already integrating the new knowledge systems into their operations.

Acronym:
EUROWELD

Title:
Welding Engineering Expert Systems

Participants:
Denmark:
FORCE Institutes
Netherlands:
TNO-MI
Norway:
Lincoln Norweld / Prime Computers
Sweden:
Avesta / ESAB / IVF / Sandvik / SSAB
Switzerland:
EPFL / Giovanola Frenes SA / Schweizerische Zentralstelle für Stahlbau
United Kingdom:
Air Products Ltd / British Alcan Aluminium Ltd / British Nucelar Fuels Plc / Nuclear Electric / Northern Engineering Industries Parsons Limited / Det Norske Vertias (UK) Ltd / BOC / The Welding Institute (TWI) / Universities of Sheffield and Southampton

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Project completed in:
June 1992

The EUROWELD expert systems bring specialised welding knowledge to the shopfloor environment. Photo courtesy of TWI, UK.

Acronym: FAMOS-SEMOS

Title:
Design, implementation and integration of sensor aided assembly systems with industrial robots.

Participants:
Austria:
Österreichisches Forschungszentrum Seibersdorf
Germany:
Fraunhofer Institut für Produktionsanlagen und Konstruktionstechnik / Isra Systemtechnik / Kontron Bildanalyse / Kuka Schweißanlagen und Roboter
Greece:
Elefsis Shipyards / National Technical University of Athens / Zenon Industrial Automation
The Netherlands:
Delft Instruments Medical Imaging BV / HCS Vision Technology
Turkey:
ÖLCSAN / Technical University Istanbul

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Project completed in:
January 1993

EU 276

A NEW GENERATION OF ROBOT SENSORS

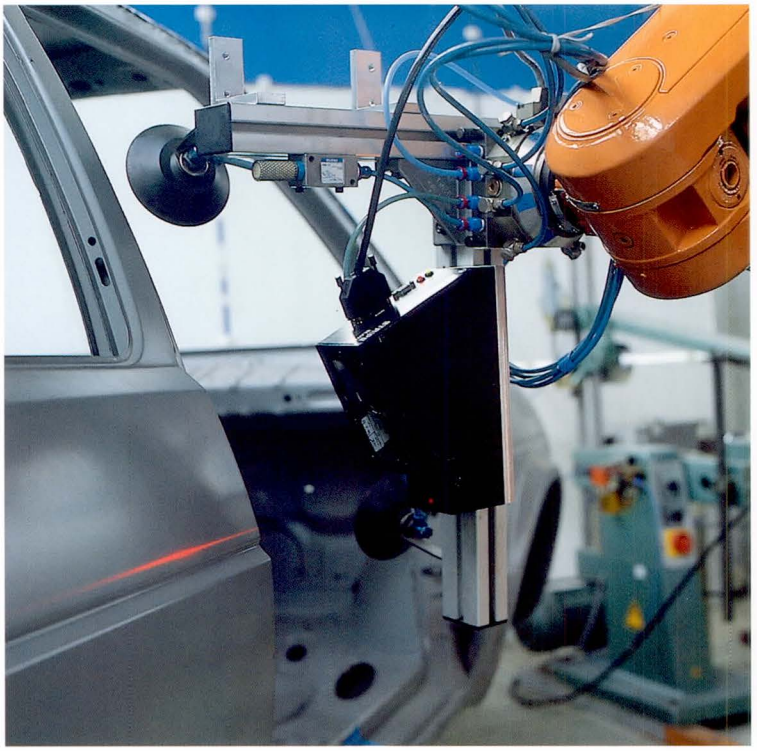
Most automated assembly systems today are 'blind', placing their drilling, welding or other equipment at certain pre-programmed positions with imperfect precision. If the component to be manipulated is not properly oriented, problems arise.

Greater flexibility and precision requires giving the robots greater self-guidance. As a result of EU 276 - FAMOS-SEMOS, a number of assembly system developers throughout Europe are supplying a new generation of self-guided robots, improving their own and their clients' efficiency, flexibility and competitiveness.

Results on the Market

SEMOS aimed to make robotic sensor systems more integrable and robust. This involved developing new controlling algorithms and user-interfaces as well as better sensor systems. The project brought together research institutes, assembly system manufacturers and their customers, allowing the suppliers to test the new sensor and software in realistic shopfloor environments.

Three sensor systems - along with the necessary control software - were developed: laser scanners, vision systems and high-precision force-torque sensors. The first system - which is both more compact and faster to comparable scanners - has already been commercialised by one partner.

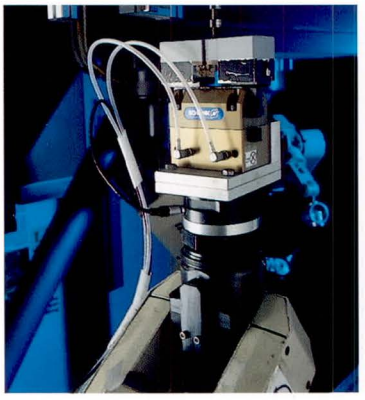


The new force-torque sensors increase the sensitivity of robot arms by an order of magnitude.

Further development has created a 3D version, also now on the market.

Another partner has commercialised a vision system that can correctly identify the orientation of a given assembly component, providing greater assembly flexibility. Another vision system resulting from the project is already being used in the textile industry to detect faults, while a new version that can find and accurately position faults on any 3D surface is on the way.

Lastly, robot arms using the new force-torque sensor are an order of magnitude more sensitive than position-based robots. A new robot controller developed to run this system - the first in Europe - will be implemented by a partner in 1995. The company is also adapting the system for orbital applications.



Faster laser scanners are already being used to make assembly line automation more flexible.

EU 279

A MINIATURE PRODUCT FOR A HUGE MARKET

Highly accurate and stable frequency sources are essential to a wide range of electronic equipment. With the rise of satellite positioning systems and further developments in communications technology, there is a growing need for a new generation of rugged, lightweight, portable and efficient sources.

The portable frequency source developed by the Swiss and French partners in EU 259 - ROSA, is the world's best. A new factory, established in 1995 in Switzerland, will supply the world market.

Optical Pumping

Within a specially designed microwave cavity inside the frequency source lies a special cell containing Ru87 - one of the two isotopes of rubidium. To one side of this cell is a special lamp, to the other a photoelectric cell. The lamp's radiation excites the outer electron of each rubidium atom into their 'excited ground state'. This makes the rubidium transparent to the radiation, which passes through the cell to strike the photoelectric cell, creating electric current.

Next to the cavity, an electronic circuit generates a microwave signal at 6.835GHz. This 'interrogation signal' forces the rubidium's outer electrons back to the lower ground state. This makes the rubidium opaque to the lamp's radiation, reducing the photoelectric cell current.

The ROSA frequency source: in production for a growing world market.

Raising and lowering the interrogation frequency by 500Hz causes the photocell's signal to rise and fall in parallel. When the photocell current is equal at both 500Hz above and below the interrogation frequency - this latter frequency is exactly equal to the absorption frequency of Ru87.

In this way, the lamp, rubidium and photocell together keep the interrogation frequency stable with an accuracy of ten decimal places.

Patented Miniaturisation

The ROSA oscillator design is a triumph of miniaturisation, and has been patented worldwide. It has the best frequency stability for its size, while products with similar stability (up to one day) are either 20 times more expensive (i.e., caesium-based oscillators) or four times larger, or both. It also takes much less time to 'power up', is significantly less sensitive to vibrations and uses less electricity.

The joint venture behind the factory expect to make a significant impact on the world telecommunications market, which they estimate at 10,000 units per year. This is not counting the market for new navigation applications spinning off from the Global Positioning System, which could be ten times larger. Lastly, 'space hardening' developments - partly funded by the European Space Agency - will take the frequency source into orbit.

Acronym: ROSA

Title:
Very High Stability and Miniature Frequency Source

Participants:
France:
Sextant Avionique
Switzerland:
Observatoire de Neuchâtel / Oscilloquartz

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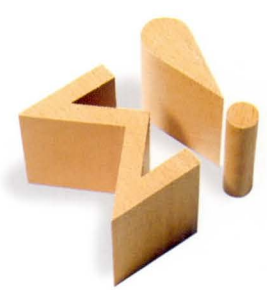
Project completed in:
December 1993



Acronym:
SOCOMAT

Title:
Development of Soft Coating Materials for Tribological Applications under Extreme Mechanical Conditions.

Participants:
Austria:
MIBA / Technical University of Vienna
Germany:
Motoren und Turbinen Union
Hungary:
Research Institute for Technical Physics

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Project completed in:
July 1994

EU 338

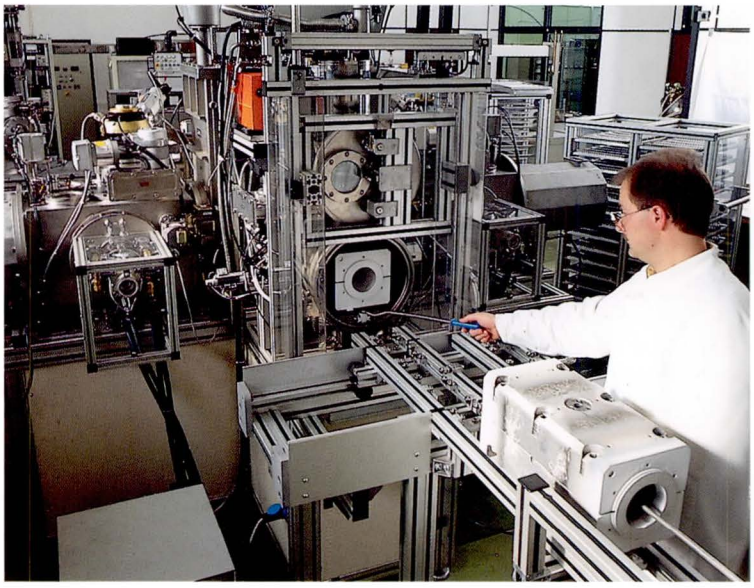
HIGH PERFORMANCE MATERIALS FOR TOMORROW'S ENGINES

Improving internal combustion engine efficiency requires increasing the ignition pressure and temperature. However current materials, particularly the sliding surfaces of bearings, are not able to cope with these more challenging conditions. Moreover, they are manufactured using electroplating, an environmentally damaging process which can only use certain metals.

In the 1980s, however, a national Austrian research project involving the Technical University of Vienna and MIBA, an Austrian manufacturer of diesel engine bearings, resulted in a patented, cleaner technology for producing better bearing coatings.
The high-rate 'sputtering' vapour deposition technique involves bombarding the raw materials for the coating with ions of a noble gas in a vacuum. The atoms of the material are ejected and then deposited onto the substrate.

World Leaders

Any good sliding layer requires a soft metal - the 'solid lubricant' - embedded in a much harder matrix. As the new technique allows layers to be created from practically any elements - even metals which are immiscible in the liquid state - this makes an enormous range of new surfaces possible. By the time the Austrian project finished in 1988, the team had successfully produced aluminium-tin layers, which significantly outperformed electroplated layers in terms of wear resistance and other operational properties.



The new process is environmentally safer and can produce bearings from practically any elements, making an enormous range of new surfaces possible.

However, a copper-lead mixture would be even tougher and could perform at higher temperatures and mechanical stresses. The SOCOMAT project was launched in 1989 to develop the new technique to produce these new Cu-Pb layers.

High-performance Cu-Pb sliding bearings: making large diesel engines more efficient.

The project involved one of MIBA's main customers - German manufacturer MTU - from the beginning, with Hungary's Institute for Technical Physics joining in 1992. In this way the project was totally results-oriented, with industrial requirements feeding back to the research institutes to stimulate and direct further fundamental research into these totally new surfaces.

The resulting sliding bearings are among the best of their kind in the world. They allow the development of large diesel engines of unprecedented efficiency and power, and have made MIBA the 'partner of choice' for manufacturers developing new diesel engines. International environmental legislation should ensure that this cutting-edge technology will be taken up around the world by the end of the century.

EU 410

A NEW LABORATORY FOR THE OPEN OCEAN

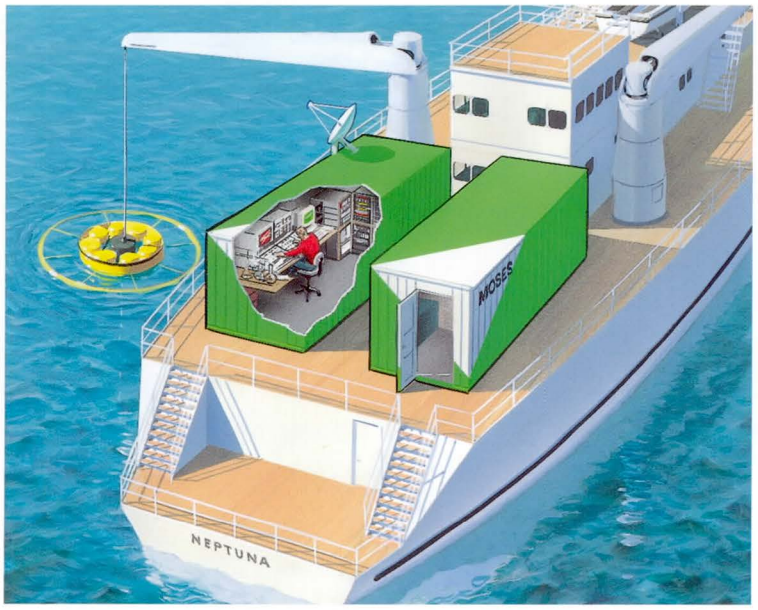
Both long-term marine research projects and short-term environmental disaster clean-ups require scientific laboratories where it counts - on the water. One common solution is to put the laboratories inside ship containers.

However, current systems are far from standardised and are difficult to work in. The lack of standardisation and modularity also makes quickly assembling systems for emergency situations very difficult.

In EU 410 - EUROMAR-MOSES, a Dutch engineering company specialising in container-based accommodation and control systems have teamed up with marine scientists in six countries to develop a new range of container laboratories. The results can be seen in action throughout the world's oceans.

A Modular, Standardised System

MOSES aimed to develop a modular laboratory system so that the engineering group - CKT Engineering - could quickly assembly a user-friendly laboratory tailored to the scientists' needs.



The MOSES container-based laboratory can be quickly tailored to individual customer requirements.

Three different construction systems were developed: a steel one for severe marine conditions, another built from lightweight aluminium, and a composite hull suitable for Antarctic work.

A grid system was developed for the containers' interior so that a wide range of standardised components - ranging from fume boxes to windows and interior walls - could be installed according to customer requirements. The containers can be also coupled together to form larger laboratories and block arrangements.

The project placed great emphasis on laboratory ergonomics. Different colour schemes, more accurate and stable air conditioning and less stressful lighting have all been developed in consultation with the research team partners to improve working conditions and comfort.

The same collaborative spirit also resulted in a set of agreed standards covering areas as diverse as electrical power supplies and working practices. By establishing these standards - and, where necessary, developing better solutions - the project has ensured that multidisciplinary, international marine research projects and disaster relief activities will not be hampered by compatibility problems.

The project's results therefore improve the efficiency of both the laboratory suppliers and the laboratory users. CKT Engineering have also incorporated the lessons learnt in the project into their other modular designed products, resulting in significant sales to the oil and other marine industries since the end of the project in mid-1993.

By working with marine scientists, a user-friendly interior design has been developed to improve working conditions and comfort. Photo: CKT Engineering

Acronym:
EUROMAR-MOSES

Title:
Mobile Station for Environmental Service

Participants:
Finland:
Hollming / Institute of Marine Research
France:
Ifremer
Germany:
Krögerwerft
Italy:
ENEA / Grimaldi Impianti
Netherlands:
CKT Engineering / Netherlands Marine Research Foundation
Norway:
AMAT

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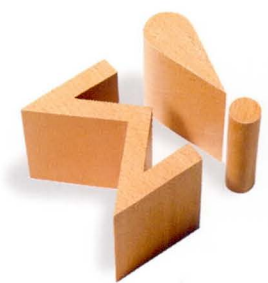
Project completed in:
September 1993



Acronym:
ENVIB

Title:
Development of Integrated Systems for Environmental Mechanical Vibration Testing

Participants:
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LMS International
France:
Matra Defence / Technicatome

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Project completed in:
December 1993

EU 424

OPTIMISING VIBRATION TESTING FOR BETTER DESIGN

The components making up automobiles, aeroplanes and space craft undergo rigorous vibration testing to ensure they perform reliably. As a result of EUREKA Project EU 424 - ENVIB, this testing process has become much more efficient and effective.

The new software produces test specifications for a component which accurately reflect its true working environment. More effective tests will translate into reduced component failure rates and more appropriate designs.

Tailored Testing for Better Designs

A test specification is usually chosen from a 'recipe book' of norms. This is a very conservative way of working - the product may be made too expensive or robust in order to pass an unnecessarily severe test, or not robust enough if the test is too lenient.

The ENVIB software allows companies to develop test specifications based on characterisations of the 'damage potential' (limit load or fatigue) of the component's operating environment. A detailed analysis is first made of the different situations a product will encounter during its lifetime. Each situation is then characterised, either with measurements taken from the mechanical environment or from calculation models. The data from the various situations is synthesised based on an equivalent damage potential. Finally, in one tenth of the time it would take without the ENVIB software, a tailored test specification is elaborated which takes the test equipment's limitations into account.

ENVIB software allows vibration testing to be specifically tailored to each component's working environment.

Each partner brought unique expertise to the project. MATRA Defence worked on characterising individual mechanical environments for fatigue or limit load damage potential. Technicatome/MVI, a French company specialised in applying sophisticated testing to nuclear engineering, developed a set of functions to automate the search and selection of useful data segments from long measurements.

Project leader LMS International, a world leader in vibration, noise and fatigue test and analysis, designed and implemented all of this in a state-of-the-art software package.

The ENVIB software was launched onto the European market in the autumn of 1994, while US and Japanese launches are planned for 1995. It will be an invaluable tool in a wide range of industries, particularly the automobile industry, where more and more electronic components are being used.

EU 664

BETTER PROTECTION FOR CONCRETE BUILDINGS

Many householders in Europe's Nordic countries must repaint their properties as often as twice a decade. Icelanders, for example, spend an average of about 250 ECU per head of population each year on repairing and repainting the outside walls of their homes.

The Icelandic, Norwegian and Finnish partners in EUROCARE-CON-COAT have shown that significant improvements in protective surface coatings are possible. The project which was supported by the Nordic Industrial Fund focused on protecting concrete from water damage which may double or even treble the length of the typical Nordic house maintenance cycle, resulting in substantial savings for millions of people and new products for the world construction market.

Building a World Market

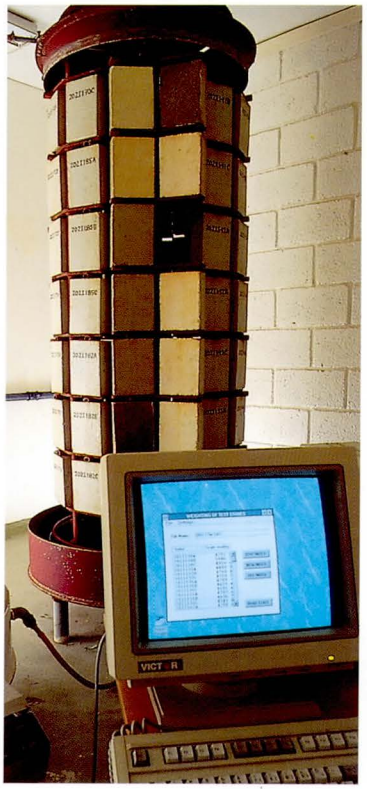
The penetration of rain-water is a key factor behind the cracks, blisters and discoloration of external paintwork. To investigate the effectiveness of different water-repelling agents and paints, the partners designed and built 'Spray-Dry' towers to simulate a range of weather conditions in the laboratory.

Around 85% of the houses on Iceland are made of concrete, while other Nordic countries generally build with cement-rendered brick or stone. Experimental equipment was therefore built in both Iceland and Norway to focus on the two building materials. The results, particularly for concrete, were quite startling.

Various concrete coatings were also tested outside.

Builders have always assumed that coatings must be sufficiently permeable to allow the wall to 'breathe'. But this turns out not to be the case, particularly for concrete. This means that much thicker, stronger coatings will not adversely affect a wall's ability to shed moisture, allowing coatings tough enough to bridge cracks and keep out rain-water and carbon dioxide are now usable, increasing building service life.

The manufacturers of paints and water repellents involved in the project are already incorporating these research results into their products, and will be able to target building industries in cold climates ranging from Canada to China. Nordic concrete manufacturers are also promoting the research results, as improving the characteristics of concrete as a building material will help their industry grow. This is particularly important for Iceland, as all non-concrete building materials have to be imported.



The 'Spray-Dry' towers simulate different weather conditions in the laboratory to test a wide range of concrete coatings.

Acronym:
EUROCARE-CON-COAT

Title:
Hydrophobic Coatings for Facades of Concrete and Rendering - An Investigation into the Effects on Transport of Moisture

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Iceland:
B M Vallá / Icelandic CementLínubönnun /- Málning / The Icelandic Building Research Institute / The Technological Institute of Iceland
Norway:
Jotun / Norsk Leca / Scancem Chemicals / The National Institute of Technology / Wilh. Willumsen

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Project completed in:
October 1993

Acronym:
TOLEDO PV-1

Title:
1 MW Photovoltaic Power Plant in the Centre of Spain

Participants:
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Endesa / Unión Eléctrica Fenosa
Germany:
Rheinisch-Westfalisches-Electrizitaetswerk

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Project completed in:
Spring 1994

EU 726

MAKING THE MOST OF THE SUN

Of all energy sources, photovoltaic solar energy - where solar cells convert light directly into electric current - is the most environmentally benign. However, costs remain prohibitive for large-scale applications.

As a result of EU 726, a 1MW photovoltaic plant has been established in Toledo in central Spain to investigate just how economical this energy source can be made. The project brings together two major solar cell manufacturers with energy utilities and research institutes in Spain and Germany, and was also supported by the European Commission's JOULE and THERMIE energy research and development programmes.

The 1MW photovoltaic plant established outside of Toledo, Spain, uses both mono- and polycrystalline cells (left and right, respectively).

Twin Sources of 'Green' Energy

The new photovoltaic plant - the largest in Spain and among the largest in the world - has been built alongside an already existing hydroelectric power station, so that renewable energy is produced throughout the region's rainy winter and sunny summer months. The 8000 m² site contains three fields of photovoltaic cells - two fields with a maximum capacity of 450kW, and a third, 100kW capacity field.

The plant addresses a number of different technologies in order to investigate how cheaply photovoltaic electricity can be produced. Three types of solar cells from two different manufacturers - BP-Solar and NUKEM - were used.

The small field uses a simple solar tracking device, optimising the amount of incident radiation.

One of the large fields features panels made from polycrystalline solar cells, which have the potential to be manufactured more cheaply than the traditional monocrystalline variety. In addition, the spacing and angle of the stationary solar panels were optimised, as were the physical supports and the cabling. Even plantlife was brought into the picture - small bushes were planted to keep the amount of dust blown off the ground and onto the panels to a minimum.

Another significant development was a new type of inverter to convert the direct current produced by the small field into alternating current suitable for the electrical grid. By itself, the new Isolated Gate Bipolar Transistor inverter is more expensive than standard thyristor-based inverters. However the new unit makes other equipment unnecessary, reducing overall costs. And as it will be suitable for a much wider range of applications than photovoltaic power, manufacturing costs will drop with widescale commercialisation.

The plant was inaugurated in Spring 1994 and provides an excellent demonstration of the state-of-the-art, and points the way forward for future photovoltaic power plants.

EU 727

TOWARDS TOMORROW'S AUTOMATED PORT

Shifting heavy good containers around ports usually requires many operators at the helms of cranes and land vehicles.
With port traffic growing at 6% per year, a few port operators have already introduced automated cranes to lower labour costs.
Automating a 60 tonne container vehicle, however, usually involves installing expensive guide paths.

The alternative is a free-ranging, autonomous guided vehicle (or AGV). While other AGV systems are limited to indoor applications or very slow speeds, the AGV developed in EU 727 - FRAIT is fast and suitable for typical port conditions.

Sophisticated Flexibility

The FRAIT prototype is a full-sized container transporter, built by the Dutch partner Terberg Benschop. It is fitted with computerised drive control systems and two radars, which scan its surroundings six times a second from both ends of the vehicle.

Unlike other navigation systems, radar is unaffected by rain or fog, making it ideal for the port environment. FRAIT's radar system was adapted by the British SME Firefly Ltd from an air-to-ground missile radar, developed by project partner GEC-Marconi.
Although the military radar has an accuracy of only 30 cm, sophisticated algorithms have improved this accuracy by a factor of 120.
The radar can distinguish a man lying on the ground from an object one metre away, and is programmed with a plan of the port layout, allowing it to immediately identify any unexpected object up to 35 metres away.

From missiles to AGV: GEC-Marconi's radar system

FRAIT: bringing high-speed automated container handling to ports without expensive guide path systems. Photo: Kevin Phillips

The AGV prototype's "Nerve Centre"

The prototype on-board computer system consists of a PC connected to 12 transputers. One transputer subset takes instructions from the port's central control - transmitted by radio link - to generate paths to follow in order to pick up and deposit containers.

Another constantly receives data from the steering system and radars to calculate the vehicle's position to within 50 mm.
A third transputer is dedicated to safety, and can override the control system at any point, stopping the AGV if any obstacle is detected.

In this way the 60 tonne, 18 metre long vehicle can navigate its way through a complex, although carefully controlled, port environment at over 20 km/h. This is many times faster than systems of equivalent flexibility, making it the system of choice for a growing number of ports around the world.
It has already been field-tested at Thamesport, a project partner in Kent (UK), and has the potential to capture a share of a market which is expected to grow significantly in the next decade.

Acronym:
FRAIT

Title:
Free Ranging Automated Industrial Transport

Participants:
Netherlands:
Terberg Benschop
United Kingdom:
Firefly / Marconi Defence Systems / Thamesport

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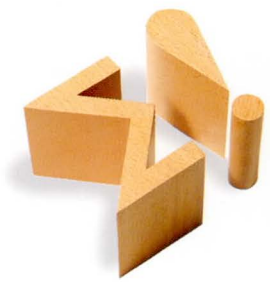
Project completed in:
December 1993



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he EUREKA Secretariat pro-
uces a wide range of publica-
ons explaining the activities
f both the EUREKA Initiative
nd individual projects.
nless otherwise stated, all
ublications are available
n English, French, German,
alian and Spanish.

UREKA News
ublished 4 times a year to
xplain the overall objectives
f the EUREKA Initiative and
eport on the activities of spe-
fic projects and EUREKA
vents.

ogether for the Future
ontains a short general
escription of the Initiative

ademecum
ontains the basic EUREKA
xts, a guide to EUREKA
roject participation and
ther useful information on
ie EUREKA network.

upportive Measures
xamines how EUREKA's
upportive Measures can help
EUREKA project reach a
uccessful conclusion.
nglish)

pen the door to EUREKA
xplains how participants
om non-member countries
n take part in EUREKA
rojects. (English)

uidelines for the Protection
f Technological Information
guide to protecting intellec-
al property and technologi-
cal information in a EUREKA
project. (English and French)

Guide to Standardisation
A guide to the European and International world of technical standardisation, and how to take standards into account in your research and development. (English and French)

Cross Border Innovation
A guide on managing international, cooperative ventures in industrial research and development. (English)

International R&D Cooperation Agreement Checklist
A checklist which summarises the points that are usually taken into account when negotiating and settling a EUREKA collaboration agreement. (English and French)

Le contrat modulaire d'assurance des projets EUREKA
A guide which describes the risk insurance scheme available to EUREKA projects in France. (French)

Guide for the Smaller Enterprise
A guide offering advice to small or medium sized enterprises wanting to enter or start a EUREKA project. (English)

EUREKA Technological Folders (English)

Each Folder covers a single technological area. It includes a brochure providing basic statistics and an overview of the area, and a set of individual project profiles, each presented on a double sided sheet.

The folders now cover all nine Technology areas:
- *Medical and Biotechnology*
- *Communication Technology*
- *Energy Technology*
- *Environment Technolgoy*
- *Information Technology*
- *Laser Technology*
- *Materials Technology*
- *Robotics and Production Automation*
- *Transport Technology*

HE EUREKA DATABASE

can be supplied on request from National Project Coordinators or the EUREKA Secretariat in Brussels.
can be consulted on-line on the ECHO server (European Commission Host Organisation) in Luxembourg with the public password: EUREKA.
can be consulted using the CCL language or via a menu system (using the CALL EUREKA command):

via the public packet switching etworks X25 or X28.
odem parameters:
Full duplex
Even or no parity
7 data bits
1 stop bit

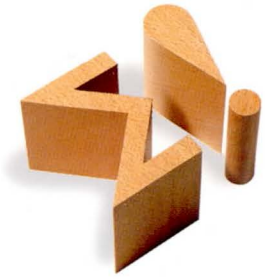
NUA (Network User Identity): 270448112
NUA prefix: 0
NUA prefix for the U.K.: A9

2. via the international telephone network.
Modem parameters:
Transmission speed between 300 and 9600 baud
Full duplex
Even parity
7 data bits
1 stop bit
Telephone number: +352.42.03.47

3. via INTERNET.
Address: TELNET ECHO.LU

4. via the TELETEL network, using a bi-standard MINITEL terminal.
International code: FM.
Access code: 3613
Service: ECHO21
When the link has been established, the *"C.Scrn"* (<_) key must be used instead of *"Next"* or *"Send"*.

5. via the academic research networks (RARE/COSINE) connected to EUROPANET.
NUA (Network User Identity): 204370310099
NUA prefix: 0
NUA prefix for the U.K: A9



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