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Proposal for a

COUNCIL DECISION

adopting a specific research and technological development programme of the European Economic Community in the fields of industrial manufacturing technologies and advanced materials applications (BRITE/EURAM) (1989-1992)

(presented by the Commission)

V. SUMMARY

This BRITE/EURAM programme integrates the actions foreseen in line 3.1 and 3.2 of the Framework Programme for Community activities in the field of research and technological development (1987-1991) covering manufacturing technologies and advanced materials, building on the achievements already emerging in the first BRITE and EURAM programmes.

The principal objective of this programme is to enhance the competitive position of the Community's materials and manufacturing industries in world markets through the support of a programme of research and development to provide the industrial and materials technology required for innovative products and process development.

The programme will contribute to the competitiveness by stimulating cooperation in industrial oriented research at the precompetitive stage across frontiers, between different industry sectors and between industry, research institutes and universities and will also contribute to establishing the Common Market in 1992. Special considerations will be given to projects involving SMEs, in order to ensure their adequate participation in the programme.

The programme covers the following fields :

- advanced materials technologies;
- design methodology and assurance of products and processes;
- application of manufacturing technologies;
- technologies for manufacturing processes.

Industrial applied research : the programme will be implemented essentially by cost shared contracts. Projects must include at least 10 man years of activity and the total project cost should fall in the range 1 - 3 Mio ECU. The Community contribution will not exceed 50 % of total cost, the remainder to be provided by industry.

Up to 7 % of the total programme budget will be made available for focussed fundamental research in areas of materials development. Projects should include at least 10 man years of activity and fall in the range of 0,4 to 1 Mio ECU.

The Commission is also introducing a pilot scheme of Feasibility Awards aimed at assisting SMEs establish the feasibility of a device, process or concept as a means of enhancing their stature in finding a partner. The Commission would support up to 75 % of the cost of research up to 25.000 ECU lasting up to six months.

A small proportion of the total programme budget will be spent on coordinated activities.

In addition, demonstration projects will be supported. Their modalities will be determinated as projects within the first BRITE and EURAM programmes near completion.

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SUMMARY

Manufacturing industry, accounting for some 30% of GNP and employing some 41 million people, is and will remain an essential element of the Community's economy. There are, however, signs of structural weaknesses in the capacity of European manufacturers to respond to growing and increasingly more competitive demands in the more developed markets.

The case for this new programme is based, first, on the need for a positive response to the pressure of world competition in the market place for manufactured goods and in the supporting technology development of products and processes. Second, R&D collaboration, bridging national and sectoral boundaries is an effective way of exploiting available resources and a valuable route towards the internal market.

The new BRITE/EURAM programme integrates the actions anticipated in lines 3.1 and 3.2 of the Framework Programme for Community Activities in the Field of Research and Technological Development (1987-1991). It falls under the heading of modernisation of industrial sectors and covers manufacturing technologies and advanced materials. The programme builds on the experience and the achievements already emerging in the BRITE and EURAM programmes.

The encouraging signs from the first BRITE and EURAM programmes, confirmed by the BRITE and EURAM Evaluation Panels, showed that the Programmes occupied an important position in Community Science and Technology policy. Not only were a very satisfactory 80% of projects proving to be making good progress but a new and important dimension had been added through the creation and consolidation of industrial transboundary alliances for R&D, and through transfrontier links between industries and universities. It was also found that the Programmes have helped SMEs to link with large companies and universities and also to benefit from the resulting business. Smaller and less developed Member States have also participated fully.

The principal objective of this programme is to enhance the competitive position of the Community's materials and manufacturing industries in world markets through the support of a programme of research and development to provide the industrial and materials technology required for innovative products and process development.

The programme will contribute to industrial competitiveness by stimulating cooperation in industrial orientated research at the precompetitive stage across frontiers, between different industry sectors and between industry, research institutes and universities and will also contribute to establishing the Common Market in 1992. Special consideration will be given to projects involving SMEs, in order to ensure their adequate participation in the programme.

The new programme is not intended to substitute for the responsibility of industry to conduct adequate research and development in support of its needs but, as with the previous programmes, it has a catalytic role in providing the incentive to encourage the best use of the resources available in the Community.

As a result of encouragement from industry and experience from the earlier programmes, materials and manufacturing technologies are now to be included in a single programme covering the following fields:-

- advanced materials technologies
- design methodology and assurance for products and processes
- application of manufacturing technologies
- technologies for manufacturing processes.

The four-year programme will, together with the contributions anticipated through the involvement of EFTA countries, amount to nearly 1 billion ECU of activity. Of this the Commission will provide 439.5 mio ECU. There will be four separate forms of support.

Industrial Applied Research, with more than 90% of the budget, will be implemented by cost shared contracts, involving at least two independent industrial enterprises. Total projects costs should fall in the range of 1-3 mio ECU and cover at least 10 man years of activity. The Community contribution will not exceed 50% of total costs, the remainder to be provided by industry.

Up to 7% of the budget will be made available for Focussed Fundamental Research in areas of materials development where industrial progress is hindered by weaknesses in basic science. To ensure a true industrial focus for this activity which need not include an industrial partner, there will be a requirement for industrial endorsement by nominated individuals from industry. Projects in the range of 0.4 to 1 mio ECU must cover at least 10 man years of activity.

The Commission is also introducing a pilot scheme of Feasibility Awards aimed at assisting SMEs establish the feasibility of a device, process or concept as a means of enhancing their stature in finding a partner for a subsequent call for proposals for the Industrial Applied Research. These awards are intended to help offset the particular difficulties experienced by SMEs. The Commission would support up to 75% of the cost of research up to 25.000 ECU lasting up to six months. This activity will be co-financed by the Task Force SME.

A small proportion of the total programme budget will be spent on Coordinated Activities.

In addition, demonstration projects will be supported within the Industrial Applied Research. Their modalities will be determined as projects within the first BRITE and EURAM programmes near completion.

A calendar of annual calls for proposals will be announced in the first Information Package. The priority themes will be revised annually to reflect the changing requirements of industry. The regular calls are intended to overcome the problems and uncertainty for potential participants experienced from the long gaps in the previous programme.

INTRODUCTION

In its Communication of 28 September 1987[1] the Commission presented its initial comments on the programme to follow on from the first BRITE Programme[2].

The new programme integrates the cost-shared actions foreseen in lines 3.1 and 3.2 of the Framework Programme for Community Activities in the Field of Research and Technological Development[3] (1987-1991)covering manufacturing technologies and advanced materials, so building on the achievements already emerging in the first BRITE and EURAM[4] programmes. Experience with managing these two programmes together with the strong encouragement revealed in consultations with industrialists and, in particular, the Industrial Research and Development Advisory Committee (IRDAC) and the panels evaluating the first BRITE and EURAM programmes underlines the inseparable links between materials development, product design and manufacturing technology. A single programme will best serve the R&D needs of European industry.

The objectives and strategic goals set out below are in keeping with the thrust of the Framework Programme towards improving industrial performance particularly in relation to the 'modernisation of industrial sectors' and also 'towards a large market and an information and communication society'. While the development of information technology will be excluded from the new programme the application of IT will of course be encouraged. By strengthening the scientific and technological basis of European industry and encouraging it to become more competitive at international level the aims expressed in the Single European Act[5] are reflected. The Programme does not replace the responsibility of industry to conduct adequate R&D in support of its needs but it has a catalytic role in providing the incentive to encourage the best use of the resources available in the Community. This applies particularly to the established sectors of industry where the R&D base has to be seen as a more important element of company strategy.

OBJECTIVES

The principal objective of the Programme is to help enhance the competitive position of the Community's manufacturing industries in world markets through the support of a programme of research and development to provide the industrial and materials technology base required for strategic, innovative product and process development.

There are two subsidiary objectives. First, to encourage transfrontier collaboration within the Community in strategic industrial research between industrial companies and complementary centres of expertise in industry, research organisations, and universities. Second, to encourage transfer of

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[1] COM(87)307 FINAL/2

[2] OJ N° L 83,25.3.1985, p. 8

[3] OJ N° L 302, 24.10.1987,p. 1

[4] OJ N° L 159, 14.6.1986, p. 36

[5] OJ N° L 169,29.6.1987, p. 1

technology between sectors and particularly to those sectors, often with a high predominance of SMEs, which are slow in exploiting new technologies to improve their performance.

Strategic Goals

The main instrument for meeting the objectives will be collaborative, transfrontier R & D able to provide the technological tools for better products and processes. These will include the development and application of new materials and engineering technologies and encouraging the wider application of IT developed elsewhere. The tools will be aimed at meeting strategic goals for improving the performance of manufacturing industries by :

- Developing advanced materials and their processing for applications requiring improved physical and environmental behaviour, better performance repeatability and reliability, and cost effectiveness.

- Incorporation of best practice into design (i.e. materials selection and design rules for manufacturing, assembly, reliability and maintenance).

- Reduction of design to product lead time, including reducing the manufacturing lead time.

- Improving management of the manufacturing operation, including process control, product quality assurance and condition monitoring.

- Improving the cost effectiveness of manufacturing.

PROGRAMME JUSTIFICATION

The case for the programme is based, first, on the need for a positive response to the pressure of world competition in the market place for manufactured goods and in the supporting technology development of products and processes. Second, R & D collaboration, bridging national and sectoral boundaries is an effective way of exploiting available resources and a valuable route towards the internal market.

The challenge in the world market place

Manufacturing industry is and will remain an essential part of the Community's economy. It provides around 30% of GNP and accounts for 75% of the industrial workforce of some 41,000,000 people. In spite of a strongly positive balance of trade in manufactured goods of 130% in 1985, structural weaknesses have developed over the years, in particular the capacity to respond to growing demand in the more developed markets.

Within manufacturing industry there are sectors with a fast growing demand (e.g. instruments, chemicals) and sectors with a stagnating demand (e.g. clothing, textiles, motor vehicles). The common element is that the performance of the European industries and those of the most developed industrial countries will be less concentrated on maintaining or increasing market share of the total market. Instead they will seek to capture the top end of the market by new or improved products often with a high technology content in the product itself or its means of manufacture. This trend establishes technology as one of the crucial factors for the competitiveness of manufacturing industry. Its effective use in both production equipment and new products is a potential source of spectacular improvements in industrial performance. Technology can increase equipment availability, introduce flexibility into the production process and so improve market adaptability. It also makes possible smaller production runs and allows for reduction in time for manufacture. Here the appropriate application of IT systems is of relevance to all manufacturing industries. More detailed examples showing where technology could be exploited to enhance the economic performance are included in the technical areas for the new programme in Annex A.

Increasingly the distinction between leading edge and mature industries will disappear. The potential for increasing productivity and flexibility is greater in mature industries as is the incentive to employ new technology. For the future the dividing line will be between those who make full use of the available technology and those who do not, even within the same sector. Already this 'dematuring' process is evident in established sectors such as motor vehicles or clothing.

The development and adoption of new technologies is therefore crucial. However, the challenge of new technology goes far beyond sectoral definitions; it concerns the competitiveness of European industry as a whole - its very ability to exploit new opportunities.

To assess the state of Community industry and the means of improving the Community's technological competitiveness, the innovation process can be broken down into

- the creation of new technologies,
- their use in the production process and
- their implementation in products.

The creation of new technologies

Trends in the funding of research give rise to concern underpinning the need for an increased level and synergy of R & D activity in Europe. The funds devoted to R & D activities for the EEC (70 billion ECU) were, in 1986, only about 60 % of that of the US. As the annual increase was about 4 % in both cases this difference is unlikely to change rapidly. In contrast, while Japanese R & D expenditure is 30 % below that of Europe its growth rate, 9 %, is twice as high. Looking at research expenditure as a percentage of gross domestic product, this rate reached 2,8 % in Japan and US in 1985. Only FRG approached this level, which together with France and UK at 2,3 % exceeded the Community average of about 2 %. A further impediment to European industry benefitting from applied research and technology transfer comes from the lower industrial contribution in the distribution of R & D between industry and the public sector within Europe.

A quantitative comparison identifies an overall weakness in the R & D potential of the entire Community. It, of course, neglects the effect of twelve components between which there is little synergy. The European effort tends to cover the whole range of R & D activity from basic to industrial prototypes. Japan and the US concentrate much more on R & D with a view to later industrial use. This difference in strategies means that the Community lags behind in crucial enabling areas such as new materials and production technologies, in addition to the microelectronics based technologies.

Technology in the production process.

In production technology the Community is beginning to catch up with the use of advanced computer aided techniques and equipment after a slow start and here the advanced IT developed in the ESPRIT programme is of major importance.

But improvements are needed concerning the reliability and predictability of machine behaviour as enterprises become more dependent on expensive machinery. Recognising the characteristics of Community industry consisting of few large and many medium sized and small enterprises, there is a particular need to reduce the complexity and cost of new production technologies and systems. However, the evidence from the first BRITE and EURAM programmes confirms that in the Community industry there is a greater confidence that it is capable, particularly when assisted by universities and research institutes, of mounting a realistic challenge to the market performance of the major industrial competitors.

Technology in products.

Exploiting new technology in products is essential whether directly as in the use of new materials or indirectly through improved design, reliability, servicing or marketing. Here the Community industry has generally been less successful than its competitors, particularly from the Far East. In fast moving advanced technology markets the Community industry has often retreated into established production of engineered commodities such as colour televisions without an equivalent activity in R&D - so leading to losses in industrial employment. Because of the government support in the US and Japan, the Community lags behind in the engineering aspects - performance and methods of component manufacture of new materials. Failure to exploit new materials to improve product performance, durability and reliability bars the Community from competing in rapidly expanding and traditional markets.

The programme aims to reduce the constraints and limitations at each of these levels and help to provide European industry with the necessary enabling technologies which demand an intersectorial and interdisciplinary approach.

Collaboration across frontiers and sectors

The importance of collaboration can also be demonstrated through the structure of European industry. Individual sectors of industry are not islands but are dependent on others. For example, to be competitive established sectors must incorporate the products of the high technology sectors, including microelectronics and information processing, for which they are a very important market, into their products, processes and business systems. A similar dependence extends to the service sector as much of its activity is geared to manufacturing.

Unfortunately, the supply chain in Europe is often fragmented compared to that of its major industrial competitors. Japan has a relatively small number of giant financial holding companies while the US has economy of scale. In Europe a very varied market is met by a large number of suppliers who in turn are customers for many suppliers of components, processes and services. Too often there is poor communication between functions - design, engineering, manufacturing, purchasing, marketing - both within and between companies. This situation slows down the rate of innovation and its effective implementation. It is desirable for both customers and suppliers to be working together to ensure that resources are directed to R&D which will bring the maximum benefits. Almost always supply chains involve firms of all sizes, so that attention has to be given to ensure that technology based SMEs can also benefit, recognising their particular problems, such as a lack of human and financial resources to plan and implement change. Indeed, in almost all sectors industrial success will often be largely influenced by performance of SMEs in the role of suppliers of materials, components or services.

The commercial development of tools - the products and processes - is the primary responsibility of those companies able to exploit the commercial benefits they bring. This development process is more likely to be successful if companies have access to preparatory or pre-competitive research and development at the leading edge. There are considerable resources available in the Community which should be used to best effect. The catalytic role of Community programmes can provide the incentive for this collaboration to take place.

Pre-competitive R&D - applied research not leading directly to commercially exploitable results - is an essential enabling instrument for competitiveness but may be too wide in application, of too long a time scale, or too risky to make it acceptable for funding by single companies, particularly SMEs. It is exactly in this field where existing resources in Europe are not exploited to a sufficient level.

Additional and external funding will make it possible to provide, at the European level, the linkages which enable the complementary expertise of those in industry and research organisations to work together and so specify, manage and implement the work required. The Commission support will enable those able to make a worthwhile contribution to the task in hand to participate towards the internal market.

Towards the internal market

The challenges within the programme fall squarely within the scope of the Framework Programme. Only by working together across national boundaries can Europe look to a future where the strength of the Far East and the US manufacturing base can be challenged on a broad front. Working together in R&D will lead to companies seeing mutual benefits for their future in continuing collaboration in R&D and possibly extending this to marketing, manufacturing and training. Collaboration also provides opportunities for bringing application expertise to new sectors through demonstrations of technology or transfer of human expertise. In a more direct response to the challenge of the single integrated market foreseen for 1992, the involvement of partners from several countries will be a valuable step in the harmonisation of manufacturing practices. This convergence of practices will encourage the quest for standards. One of the outcomes of the BRITE/EURAM programme will hopefully be an enriched range of European standards produced under the aegis of CEN and CENELEC. Standardisation at European level contributes, on one side, to break down the technical barriers to trade within the Community and, on the other side, it enhances the competitiveness of European industry in its home market. The inclusion of work in support of the standards making activity should not be a definitive selection criteria for the programme. However, encouragement will be given to projects which aim to exploit a potential market opportunity arising from advancing the development of new standards or other codes of practice, including those which might be associated with environmental or safety considerations. The European dimension realised through the transfrontier collaboration ensures complementarity with nationally supported initiatives.

An integrated Community is also better served when its technical expertise is available to reach out across national boundaries. Community support can also result, because of the structure of the market place or high cost of R&D, in work which is unlikely to be funded by one company or one country, thereby making more efficient use of resources for research, more efficient use of capital equipment or the generation of a critical mass of expertise.

ACHIEVEMENTS OF THE FIRST BRITE AND EURAM PROGRAMMES

The programme builds on the encouraging signs which have already emerged within BRITE and EURAM and recognised by their evaluation panels. Though the first research work funded under the BRITE programme did not start until early 1986 and, in the case of EURAM, not until late 1987, encouraging progress has already been made with most of the projects underway in the process of fulfilling their objectives. The BRITE Evaluation Panel judged that a very satisfactory 80% of projects were progressing well. BRITE had helped to consolidate industrial transborder alliances and to create new ones. The Panel considered that BRITE had benefitted SMEs, both by being involved in research and from the resulting commercial opportunities. The smaller and less developed Member States had participated fully. Important results are appearing which could not have happened without an enabling instrument for transboundary collaborative research. Examples are given at the end of this section.

In the first BRITE and EURAM programmes more than 1200 proposals were received involving almost 5000 individual partners. 130 experts from different industrial sectors, universities and research institutes from all Member States were involved in the technical and economical evaluation, and assessing the potential industrial impact of the proposals. These experts worked together in groups in Brussels under the chairmanship of Commission officials not belonging to the staff of the programmes.

About 300 projects are now being supported. Within BRITE, of the projects being supported 60% of partners are from industry, 21% from research institutions and 19% from universities. There was significant SME participation amounting to about 35% of the industrial partners. The major difference in EURAM was that somewhat less, 44% of partners, are from industry, the major part being from universities and research institutes. In both cases there was an encouraging level of collaboration between universities and industry. Both programmes included projects with a high materials element integrating problems of design and production. Recognising that in many cases no clear distinction can or should be made between a programme with objectives relating to materials applications and production technology, underlines the need for a single programme to follow on from the first BRITE and EURAM.

A characteristic of the previous BRITE and EURAM programmes was the large number of very good projects which were not supported because of budget limitations. In fact only about 1 in 4 of good projects was supported. The scale of the opportunities lost among those whose projects were rejected in the earlier programmes makes a strong case for the substantially larger budget for the new programme, an argument endorsed by the BRITE Evaluation Panel.

The programmes have helped to remove the bias against technical collaboration in Europe and so will help in the realisation of the single market. The level of interest will increase and this was underlined by the BRITE Technological Days held in December 1987 which attracted more than 1000 delegates.

To achieve a better balance between the available funds and the number of good projects submitted, the information pack will seek to give a more precise definition of the projects which will be supported. This will put greater emphasis on the evaluation criteria and more closely define the priority themes. The introduction of an annual call for proposals should also help. As before, the project selection will be undertaken by independent experts familiar with the needs of industry, drawn from industry itself, but also including experts from universities and research institutes. The fairness and efficiency of this process was seen as a particular feature of the programme. Careful consideration will be given to the improvements recommended by the BRITE Evaluation Panel.

An important feature of the first BRITE programme was the 'expression of interest' mechanism operated by the Commission which allowed those interested in forming partnerships to be put into touch with one another. Even when a project did not emerge productive introductions often resulted. This process was supported by the contact points in each Member State who provided a source of information close to intending partners. With EURAM advanced materials networks organised with the European Materials Research Society (EMRS) and in conjunction with industries and universities has provided a valuable co-ordination for work in 11 different specialised fields of materials research. The new integrated programme will build on the successful features of the first BRITE and EURAM programmes, taking account of the comments from their Programme Evaluation Panels.

Results from the first BRITE and EURAM programmes.

The following examples illustrate early achievements and targets from the earlier programmes.

European mould makers are often SMEs and face a challenge not only from their major customers, such as the car industry, which requires its suppliers to be equipped with CADCAM but also from the strong competition arising outside the Community. The objective is to shorten the whole process of mould design and manufacture, which now is typically six months. Success would increase the competitiveness of the mould maker through shorter delivery times, and by allowing smaller batch sizes or more complex parts to be produced from the moulds. The aim is to produce moulds with little or no reworking while currently moulds may have to be modified 5 to 10 times. In the consortium seven enterprises, ranging from very small to very large, and two research organisations are involved. The first part of the project investigating the weaknesses of existing approaches has already led to useful developments in mould design.

The man-made fibre industry is anticipating even fiercer competition from competitors outside Europe where developments in higher speed meltspinning have been identified. For this reason major man-made fibre producers in three Community countries, a specialised equipment maker together with two research institutes, have come together to improve the technology for the melt spinning of continuous synthetic yarn. This project aims at improving the productivity and reducing the manufacturing costs of melt spinning of nylon and polyester by increasing the collection speeds from typically 6 km per minute up to 10 km per minute. Key requirements are to ensure zero defect operation and delivery of yarns of the required quality. This project could lead to a cost reduction of up to 10% in the final product. Preliminary results indicate that this aim is feasible.

The most expensive part in the clothing production process is the assembly of cut parts. It accounts for roughly 50% of the production costs, of which about 80% is the handling of the parts and only 20% the actual sewing process. A clothing manufacturer, a machine manufacturer and a robot producer from two Community countries have come together to develop a flexible system which is capable of receiving stacks of cut parts, typically of between 50 and 200 pieces, removing a single component from each stack and then carrying out several stages of sequential assembly automatically. The system is limited to operations that start and finish flat. Final assembly will continue to be manual. As most of the handling is 2-dimensional, there is scope for cost reductions in the production process of up to 25%, while maintaining and even increasing the flexibility and the quality. Considerable progress has been made towards the objective of a full-scale laboratory prototype assembly system. This laboratory prototype could be the basis for the first fully automated flexible clothing assembly cell in Europe.

Dyeing of fabrics is one of the most important steps in the manufacturing process of textiles. About 80% of the fabrics are dyed in continuous line. Currently about 5% of material is waste because of variations in shade and colour. Two textile producers, an equipment company and a research laboratory from three Community countries are collaborating in a project to study the parameters of continuous dyeing and to develop on-line sensors and real time control mechanisms that will give consistency and shade repeatability. A feasibility study has shown that it could be possible to control the key process parameters to give consistent shade and colour across the width and along the length of the fabric. A successful outcome could lead to price reductions of up to 20%, which would place the European textile industry in a stronger position in an increasingly competitive world market.

Welding takes up 20 - 30% of production time in European shipyards. While about 80% of welds are made in Japanese yards with automatic or semi-automatic devices, about 80% of welds in Europe are still made manually. To improve the European technological capability a shipyard, a supplier of welding equipment, a paint producer, two welding research organisations and a shipbuilding research organisation, sponsored by shipyards, have joined together to achieve a large-scale shift to mechanised welding processes. The aim is a simple automation of the welding of sub-components and the application of welding robots, within the context of the shipbuilding industry. The welding problems posed by the primer of the steel are also being studied in order to reduce the influence of the prefabrication primer on mechanized, automated and robotic welding. First results have led to data which could serve to define normalized fume boxes. Considerable progress towards automated welding has already been made.

Laser technology will be used as a tool to cut and to identify defects in natural materials. This project, involving industries and research organisations from two Community countries, aims at the reduction of material waste and an increase in productivity rates for industries based on the use and transformation of indigenous materials such as cork, leather, wood and marble. The major objectives of research are to define the laser cutting process and parameters for each material, especially for cork and marble where laser cutting is a promising technique, and to develop methods for defect identification by size, shope and colour. Cutting speed should be increased by up to 35% for leather and 50% for cork using laser, compared to manual cutting. It is estimated that such developments could lead to the waste of material being reduced by 40%. These important economic benefits explain the high interest from industries which are generally SMEs.

In the field of materials research, a variety of projects address the substitution of strategic materials with more available and versatile materials leading to products with enhanced physical or mechanical properties. The degree of dependency of important European industries on metals such as chromium, cobalt, tungsten or some rare earth metals, supplied mainly from outside the Community, can be reduced by substitution. For example, bringing together partners with expertise in metallurgy, process engineering, design and magnetic theory has enabled a new and more efficient production process for magnetic powder material of the new alloy iron, neodymyum and boron to be developed for the manufacture of high energy permanent magnets. In another example, hard particles and ceramic whiskers introduced into white cast iron powder produced a new hard metal powder replacing more expensive and alloyed steels. Similarly, in electrical contact and switching materials, a new silver alloy with a drastically reduced silver content was found and is now patented and in commercial production.

The stimulation of cooperation in European manufacturing industry is, in many sectors, breaking new ground and providing mutual help which ultimately must result in a stronger position in the market place.

THE TECHNICAL CONTENT OF THE PROGRAMME

With a limited budget, less than 4 % of industrial R & D spending by Community Governments, the programme must focus on the R&D most likely to be effective in meeting those goals which are most critical to securing the competitiveness of the Community's manufacturing industry, in the medium term, that is 5-10 years hence.

The technical areas for the programme have been selected after an extended process of consultation. In addition to a postal enquiry sent to some 1,000 companies across the Community, this involved inputs from many individuals, professional and trade associations from a wide range of manufacturing sectors together with the industrial technologies and advanced materials working groups of the Industrial Research and Development Advisory Committee (IRDAC). The Member States were consulted through the appropriate Management and Co-ordination Advisory Committees (CGC).

The technical areas shown in greater detail in Annex A cover :

- Advanced Materials Technologies - the development of advanced materials and their processing for industrial use.

- Design Methodology and Assurance of Products and Processes - engineering technologies for product design, means of manufacture and assurance, together with design and assurance of manufacturing processes.

- Application of Manufacturing Technologies - identification and addressing the needs of manufacturing industry and particularly the less advanced sectors, many of which have a major part made up of SMEs.

- Technologies for Manufacturing Processes - new and improved manufacturing techniques for more effective production.

In these areas there is a strong need for collaborative research, bringing together partners drawn from suppliers of materials or components, users (including where appropriate the end user), the suppliers of expertise and equipment for use in design, control, testing and systems integration, together with the research organisations and universities. There are opportunities for firms of all sizes.

BRITE/EURAM in a Global Industrial R&D Context

Consultations with industry have confirmed the requirement for a better awareness of emerging technological development as an important element of the technology strategy of industrial companies both large and small and, at the same time, for reinforcing the market pull of the BRITE/EURAM Programme as recommended by the BRITE Evaluation Panel. The Commission will take further initiatives, such as workshops, in consultation with IRDAC and the CGC. The aim will be to bring together the global science and technological trends with the planning needs of individual companies recognising this cannot be limited to a single sector but must also involve related sectors which are major customers and existing or potential suppliers of materials, equipment and expertise.

PROGRAMME IMPLEMENTATION

In line with its overall objectives, the programme will be open to enterprises from all sectors of industry and research organisations, including universities, within the Community and EFTA countries. Projects involving partners from EFTA countries will be welcomed where their participation can contribute to the competitiveness of manufacturing industry as a whole. The projects must fulfill the normal eligibility criteria with the EFTA partner being additional to the required type and number of partners from the Community. There will not be any financial contribution from Community towards the participation costs of partners from EFTA countries who will be required to contribute to the programme overheads.

Within the Programme there will be four separate forms of support. The Industrial Applied Research will be the principal action with more than 90% of the budget. There will also be Focussed Fundamental Research with up to 7 % of the budget - that is one fifth of the budget for the work on materials, together with Feasibility Awards for SMEs and support for Co-ordinated Activities with approximately 0.5% and 1.5%, respectively of the programme budget.

To ensure the objectivity of the selection procedure and the selection criteria, the details will be established in advance taking the advice of the CGC.

Budget and Staff

The indicative allocation of funds between the different technical themes given below reflects the experience of the first BRITE and EURAM programmes, together with a grouping of the sub themes in such a way that the main themes for the manufacturing elements of the programme are evenly balanced. The size of allocation to the materials theme also reflects the balance of funding foreseen in the Framework Programme for this subject. The actual allocation will be determined in conjunction with the CGC taking account of the response to the calls for proposals.

	%
Advanced materials applications	30
Design and assurance of products	21
Manufacturing systems	21
Technologies for manufacturing processes	21
Administration	2.5
Personnel	4.5
	100.0

The total budget for the execution of the programme will amount to 439.5 mio ECU including expenditure on staff whose costs will not exceed 4.5% of the Community contribution.

In managing the programme, the Commission will increasingly seek the help of external experts in the technical monitoring of projects in order to ensure the necessary technical expertise. The BRITE evaluation panel has also made a similar recommendation.

Industrial Applied Research

The principal form of support for industrial applied research of a pre-competitive character will be through cost shared action. The conditions for participation will be that in each project there will be at least 50% financing from industrial partners and at least two independent industrial enterprises from different Member States per project. To be classified as an independent enterprise, research organisations should normally receive the industrial 50% in direct payments from nominated companies involved in steering the project. Recognising the important role of SMEs in developing the manufacturing base of the Community and the merits of their participation in the programme, the Commission is considering, in conjunction with IRDAC, how best research organisations can act within the programme as à focus for meeting the R&D needs of SMEs. Projects should include at least 10 man years of activity, the realistic minimum for an effective collaborative project, and the total project costs should fall in the range 1-3 mio ECU. Subsidiaries of multinational companies based outside the Community may participate if the R&D and exploitation takes place within the Community.

Focussed Fundamental Research

In some areas of materials development industrial progress is hindered by weaknesses in basic science. These areas will be identified in the Information Pack for each call for proposals. Transfrontier co-operation would be required but there will not be a requirement for partners to include an independent industrial enterprise. However, to ensure the industrial focus, there will be a requirement for industrial endorsement by nominated individuals from at least two independent industrial enterprises. Each individual will be required to commit at least two days per year in steering the project. Projects should include at least 10 man years of activity and fall in the range of 0.4 to 1 mio ECU total project costs.

Feasibility Awards for SMEs

The Commission will introduce a pilot scheme of Feasibility Awards aimed at assisting SMEs establish the feasibility of a device, process or concept as a means of enhancing their stature in finding a partner in a subsequent call for proposals under the shared cost action. The Commission will support up to 75% (maximum 25000 ECU) of the cost of research lasting up to six months. High standards of evaluation will ensure that the awards are highly competitive and recognised as prestigous. This scheme will be co-financed by the Task Force SME.

Co-ordinated Activities

In cases where work, supported by national funds or entirely privately funded is already going on, the Commission's role may be limited to simply organising the co-ordination of the work and the Community funding confined to covering the cost of such co-ordination activities. However, in certain cases where it is clear that strategically important work requires more than simple co-ordination, the Commission could, in consultation with the CGC, consider a higher Community funding.

Demonstration Projects

It is to be expected that demonstrations of project results will be required as the wide range of projects supported within the first BRITE and EURAM programmes near completion. The type of support needed will be included within the Industrial Applied Research and will be defined with the advice of the CGC and reported on during the mid-term review of the programme.

Calls for Proposals

The closing date for the first of the annual calls for proposals is expected to be in March 1989. This is subject to the adoption of a Common Position by the Council before the end of 1988. By early autumn of 1988 an advance call for proposals, giving early warning of the programme, will be published in the Official Journal for those intending to participate.

There will be a separate call for proposals for the Feasibility Awards. This will take place at about the same time, in order that the winners can be selected and have undertaken the work in advance of the second call for proposals for the Industrial Applied Research.

As a basis for calls for proposals the Commission will, in consultation with the CGC, establish and update annually information packages specifying detailed topics and priorities within the scope set out in the Technical Annex to the Council Decision. For this purpose the Commission will encourage an exchange of views between related sectors about their future technology needs. A similar but simplified information package will be adopted for the Feasibility Awards to SMEs.

To assist in the process of finding partners, potential participants would be invited to submit an 'expression of interest' so that they can be put in contact with those having similar interests. The network of 'national contact points' within the Member States will continue to be encouraged to provide an initial form of introduction to the programme. The arrangements for expressions of interest and the national contact points are of particular benefit to SMEs and will be developed in consultation with the CGC.

PROJECT SELECTION

Experts, from industry, research organisations and universities, familiar with the research needs of industry will assist the Commission in the selection of projects for funding. Those projects satisfying the eligibility criteria related to conformance with the technical themes, composition of partnerships, and project size will be judged on the basis of the relevance of the project to advancing industrial performance and to the technical quality and degree of innovation. Project partners should include those who are able to follow through the results into industrial exploitation.

A particular welcome will be given to projects which :

- encourage the wider use of more advanced techniques, processes and materials associated with CADCAM, modelling, expert systems, etc.; including those developed in other Community supported Programmes such as ESPRIT.

- establish links between enterprises from different horizontal or vertical sectors, particularly bridging the customer-supplier interface;

- exploit the capacity of SMEs to provide innovative solutions to technical problems and also open up advanced technology for more effective use by SMEs;

- aim to exploit a potential market opportunity which will arise from advancing the development of new standards or other codes of practice including those which might be associated with environmental or safety considerations;

- aim to develop a level of human interaction with the manufacturing system or process which best serves and extends man's creative and intellectual abilities and capacity, while taking away the tedium and drudgery of repetitive or undesirable tasks.

RELATED EUROPEAN PROGRAMMES

Links with complementary EC programmes are aimed at avoiding gaps and avoiding unnecessary overlaps. For example, some of the technical areas are complementary to parts of the work programme for the second phase of the ESPRIT programme. However, the primary objectives and scope of the programmes are very different. Links between the programme managers will encourage the wider use of appropriate deliverables from ESPRIT, such as advanced manufacturing systems approaches, within projects. Of course, proposals which fall clearly within ESPRIT will not be considered within the new programme. In the reverse direction it is anticipated that the wide sectorial coverage within the new programme would provide a valuable input into the periodic redefinition of the ESPRIT Work Programme. There will be similar exchanges of information with the BCR, ECSC Steel Research, and SPRINT Programmes and with appropriate COST actions. Links will also be maintained with appropriate JRC activities. Care will also be taken to ensure that the envisaged Aeronautical, ENERGY and TELEMAN Programmes take into account the scope of BRITE/EURAM.

In the important area of high critical temperature superconductivity, the programme will, together with other Community programmes including ESPRIT and SCIENCE form part of the Community Superconductivity Action[6]

Recognising that successful innovation and its implementation depends on appropriately trained and experienced people, links with the SCIENCE Plan and the COMETT programme and related actions will aim to develop the scope for increasing the human transfer of technology within the new programme and this will include grants for students undertaking work related to the themes of the programme.

In addition to exchanging information at the stage of programme definition and setting of priority themes, unnecessary overlaps between programmes will also be avoided by involving teams from other programmes in the selection process itself.

There will also be a continuing exchange with the EUREKA Programme and this will include initiatives such as joint workshops. This will be aimed at accelerating the path of innovative R&D into the market place. Projects within the new programme could be regarded as establishing the pre-competitive

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[6] OJ No. C 124, 11.4.1988, p. 6

deliverables which might be taken to the market place within EUREKA. Contacts would continue to be encouraged between participants in similar technical areas.

PROGRAMME EVALUATION

In the third year the programme will be evaluated by an independent group of experts. The cost of this evaluation will be approximately 400,000 ECU.

ANNEX A

TECHNICAL AREAS FOR THE NEW PROGRAMME

1. ADVANCED MATERIALS TECHNOLOGIES

The work in this area will focus on the development, processing and application of improved or new materials and material processing. In addition to materials and composites based on metals, polymers and non-metallic materials, the work will cover materials for a range of specialised applications. Among the wide range of possible applications of these new materials, some are directly related to IT and are therefore excluded from this programme. Developments of materials already covered by ESPRIT are, for instance, dealing with magnetic, magneto-optical, optical thin films for sensors, recording media and heads, optical layers and specific materials for opto-electronics, ceramics and polymers for IC packaging and specific substrates, superconducting thin films for low current applications and devices.

1.1. METALLIC MATERIALS AND METALLIC MATRIX COMPOSITES

For metallic materials, including metallic based composites, advances in processing and alloying technologies have considerably widened the design scope. For example, castings can now be made to high accuracy and are used in critical fatigue loaded applications in ways that were not considered possible 10 years ago. The potential of metal matrix composites is in the early stages of realisation and they are already demonstrated as ceramic reinforced light alloy pistons. A major challenge is to establish confidence in the new materials and improve processing techniques of these and more established materials so as to bring production costs to competitive levels.

A particular focus of this class of materials is in those industries where improved materials can be exploited by designers to secure the reduction in operating and maintenance costs, including savings in energy, necessary for success in the market place.

Up to now most structural materials have been homogeneous metallics and alloys. Increasingly, anisotropic materials using various strengthening techniques such as particles or fibre reinforcement will be required to meet the exacting requirements of the designer. The optimised approach demands that the material is designed alongside the specific component and matched to the appropriate manufacturing process.

Goals

- Extended working life of components
- Higher operating temperatures for increased thermal efficiency
- Better and more effective material processing techniques

1.2 MATERIALS FOR MAGNETIC, OPTICAL, ELECTRICAL AND SUPERCONDUCTING APPLICATIONS

These materials are crucial to advances in a wide range of industries. Magnetic materials, for example, play an indispensable part in the electrical and computer industries. The value of their annual production worldwide is approximately 5 billion ECU. There is considerable scope for developments which permit effective and economical exploitation as, for example, polymer-bonded anisotropic permanent magnets or massive segments of metallic glass for applications such as electric motors, security systems, ore separation, medical equipment and magnetic levitation for transport.

Optical materials are of major importance particularly for optical communication in a wide range of applications such as laser beam delivery systems. New materials are emerging which have the prospect of reducing signal attenuation.

Among materials for electrical applications are those for electrochemical devices. Improved materials based on solid state ionics are needed as the basis for a new generation of batteries and fuel cells.

The discovery of high temperature superconductor materials aroused worldwide interest and is expected to have a great impact in the medium and longer term on most of the high technology industry sectors, particularly in component design for reduced energy consumption. However, many basic problems remain unsolved. The industrial breakthroughs will not be achieved without a systematic investigation of the operating mechanism and engineering problems.

Goal

- Improved materials and materials processing for optical, magnetic, electrical and superconducting applications

1.3 HIGH TEMPERATURE NON-METALLIC MATERIALS

There are estimates that the world market for engineering ceramics, including special glasses and amorphous materials, will be some 12 billion ECU within a few years. It is expected that the demand will be evenly divided between electro-ceramics and structural ceramics. The demand is increasing for high temperature materials that can also take structural loads needed to contain the processes now being used in the materials and chemical processing industries. They are also needed in the power generation, energy conversion and motive power industries instead of metals so that the energy losses due to cooling are minimized, more efficient high temperature combustion can be used and combustion products produce as little pollution as possible. In contrast to the US and Japan, the European share of today's activity is very low. The large potential of this class of materials depends on solving some difficult problems. In speciality powders, such as whiskers, there are supply difficulties within Europe. If this technology is to meet the user's needs, there will be a requirement for closer links with powder producers.

There are still many basic problems. There is a very limited understanding of the most appropriate structure, such as the optimum spectrum of grain size, for a particular application. Large scale manufacture of advanced ceramics can introduce pollution issues, considering that there may be some 40% of organic additive to be burnt off in some processing steps. Not only is it difficult to control the process to achieve desired levels of porosity, particularly in products designed with variable porosity, but there are also problems in quality assurance, both in establishing that the desired structure is achieved and also that it is defect free.

The potential application goes a long way in defining a ceramic and so there must always be close user involvement. Similarly, there is a need for the manufacturing process to reflect properly the characteristics of ceramics. Too often the equipment used is a modified version of what is used in other applications, for example, in traditional ceramics (slip casting) or even plastics injection moulding. New equipment specially designed for processing advanced ceramics will be required.

Finish machining of ceramics is not easy but even with near-net shape forming it is often necessary. Though an important aspect of ceramics technology, Europe is currently behind its major competitors.

Goals

- Design methodologies for products based on ceramics, glasses and amorphous materials
- Improved monolithic and ceramic composites and metal/ceramic interfaces for industrial applications
- Better processing techniques and quality control strategies.

1.4 POLYMERS AND ORGANIC MATRIX COMPOSITES

The world polymer market is of the order of 120 billion ECU, of which engineering polymers, including polymer matrix composites, amount to 5 billion ECU. Europe is a net importer of engineering polymers. The US with 70% of the world production and Japan with 10% are increasing market share at the expense of Europe with 10-15%. Europe has been slow to respond to the trends of general purpose materials replaced by functional materials. There are major opportunities for Europe to respond in specific applications.

Set in the context of 815000 tons as the US market for fibre reinforced thermosets in 1986, the US market for high performance composites is expected to be 10,000 tons within 5 years. Currently the market for these advanced materials is limited and mostly in the US because of the aerospace dependance. Growth will come from cheaper applications. For example, in automobiles or construction where materials have to be, typically, an order of magnitude less expensive per kilogram than for aerospace.

The polymer industry is characterised by large suppliers of raw materials, equipment manufacturers (tending towards medium sized units of larger groups supplying injection moulding machinery or extruders), specialist SMEs manufacturing moulds, or handling equipment or polymer finishing, and SMEs as component suppliers. There is however a tendency for the machinery manufacturers to restructure into larger groups and also for the major users to process more of the polymers themselves.

The availability of new polymers components with specific properties is a serious consideration in the lead time of new products. Modelling should help and is already being used in mould design and extrusion dies for simpler components but it is not yet capable of dealing with the moulding process for complex parts, and anisotropic shrinkage in injection moulding without excessive computing costs.

The major problems limiting the applications of polymer composites to motor vehicles - springs, suspension, drive shafts - include the need for more economic process techniques for composites made from long fibre thermosets and/or thermoplastics and joining composites to other components.

Moving to greater use of polymers in consumer products puts more emphasis on environmental consideration, particularly when there are some 7000 types of polymer in circulation. The scope for recycling should be included in the specification for new polymers.

Goals

- Development of polymers for specific applications
- More cost effective process techniques for parts made from polymer and polymer matrix composites
- Design rules for the specification and manufacture of engineering polymers and composites
- New polymers with improved recycling attributes
- Improved product assurance techniques

1.5 MATERIALS FOR SPECIALISED APPLICATIONS

There are classes of materials whose development is dominated by a single area of application. These will relate to either established or emerging opportunities.

New and improved materials are essential to the packaging industry which is of major economic and technical significance and had an annual turnover in the Community of about 30 billion ECU in 1984 employing about 1 million people. Packaging 'systems' are vital elements of preservation and product security 'systems' in a range of market sectors such as the food, pharmaceutical and paint industries. Innovation in this fragmented industry is essential to respond to rapidly changing market requirements focussed on the competitive edge of a customers' products. The material and its processing route must meet a novel combination of properties - strength, heat resistance, barriers to gases, liquids and micro-organisms - for the product and short lead times for the process.

For the time being biomaterials for which there is a growing world market have emerged as being of special interest for the Community. For example, the world market for joint prostheses in 1985 was 700 mio ECU and is expected to be more than double at 1500 mio ECU by 1989. In contrast to the US and Japan, biomaterial products emerge from a large number of small companies in Europe. They cannot afford the research investment to secure European competitiveness in this field. Nevertheless, the European market is sufficiently large to provide a good demand base. Its development requires effective collaboration between industry, the clinics and research expertise in universities and research organisations. Areas of potential application include bone and joint replacement, osteosynthesis materials, dental implants, drug delivery systems and catheters and materials in direct blood contact, non thrombogenic materials, and organ replacement materials.

Other materials which will be considered will include the more advanced materials for the building and civil engineering industry.

Goal

- Improved materials and their processing for specialised applications

2. DESIGN METHODOLOGY AND ASSURANCE OF PRODUCTS AND PROCESSES

The development of techniques to improve product quality and the reliability and maintainability of structures, and manufacturing systems by clarification of the design aims for both product and process, and by refinement of the criteria against which the attributes are measured. The exploitation of materials for sensors, and the reduction in the whole life costs of sensors are also included in this section. This will complement work in Community IT programmes where on-line control is treated, including monitoring and diagnostics, predictive maintenance and quality assurance.

2.1 QUALITY, RELIABILITY AND MAINTAINABILITY IN INDUSTRY

The costs relating to total quality have been estimated in one of the Member States to be some 10% of GNP and can typically range from 5 - 25% of company turnover. These costs are often unmeasured and hence uncontrolled, but it is estimated that it would not be difficult to make a reduction by 70% of their present level through better management and control.

The costs of quality are related to the imperfections and also costs of process and product assurance. A major task is to reduce the imperfection rate while reducing the assurance costs. BRITE/EURAM will contribute improvements in product quality and in the reliability and maintainability of manufacturing systems by clarification of the design aims for both, and by refinement of the criteria against which these attributes are measured. It will thus complement work in ESPRIT, where on-line control is treated, including monitoring and diagnostics, predictive maintenance and quality assurance.

However, in a world moving to low inventory or Just In Time (JIT) manufacture, the requirements for reliability and maintainability are growing more stringent. Work is needed to ensure that all elements of the process perform reliably, because their availability has become more critical with more high capital based integrated manufacturing systems. However, due to the irregularity or short cycle nature operations in these sectors, there are problems in determining the physical characterisitics of the process which can be the basis of condition monitoring systems, such as those being developed in ESPRIT.

Goals

- Improved performance measurement for manufacturing operations in a wide variety of industries
- Improved and more predictable physical and environmental behaviour of products
- Improved quality control strategies
- Design rules for reliability and maintainability of components, structures and systems including machinery operating under varying conditions

2.2 PROCESS AND PRODUCT ASSURANCE

In many sectors there has been a concern expressed over limitations of available process control and the means by which the product specified is assured. The control of processes may be limited by the understanding of the process itself as in powder atomisation, or the availability of sensors to measure and enable real time corrections to be made as in metal cutting or meat processing. In product assurance - non destructive evaluation - there are many problems in establishing the presence of significant defects such as might affect safe use as in ceramics for aero engine components, or customer satisfaction as in textiles.

Sensors are key elements in controlling any process and their importance increases with scale and flexibility of the systems they are operating within. The exploitation of materials for application in sensors, and the reduction in the whole life costs of sensors are key objectives towards better competitiviness. However, the development of small area and large area sensors, with built-in or chip signal processing, based on microelectronic related technologies, is covered by ESPRIT.

A promising area appears to be fibre optics sensors. Potentially they are cheap, attractive and capable of detecting many variables within hostile environments including electromagnetic fields. There can be problems, particularly when more than one variable changes. This is a new technology which is expected to be particularly suitable for measuring distance and liquid levels, and for fire detection.

The areas of testing, detection and inspection are well illustrated by the developing technology of optical engineering. This has a number of very attractive and industrially significant applications. However, in almost all cases applied R&D, and even some more fundamental work, is required before wide cost-effective operation is achieved.

As a technology holography is capable of meeting the motor industry's needs for tyre examination where current tests are inadequate. However, the process is currently too slow and too expensive. There would be many applications for structural and vibration testing if a breakthrough allowed the process to be easily operated by a technician.

An outstanding technical problem for manufacturing industry is that many precision manufacturing machines can work to a greater accuracy and rate than the measurement capability which is typically manual. Contactless in-situ 3D measurement and vision systems, such as those developed in other Community programmes, are attractive tools to overcome the problems to solve most of the weaknesses in tracking technology. Therefore the use of those innovative systems for testing and monitoring of products and processes based, for example, on ultrasonic measurement techniques must be a target of the programme.

A further important aspect of control technology concerns power control engineering, that is the ability to control the energy flow in industrial processes and machines for speed or position as in electric motores used in metal cutting machinery. It is at the base of advances in automation in all kinds of industry. Though there were strengths in the past, European and US manufacturers are now losing market share against Japan. It is essential for the European manufacturers of process and production machinery to have access to the most suitable technology. Advancing this technology in Europe will depend on close co-operation between producers and users exploiting advanced materials and IT techniques.

Goals

- Reduction of whole life costs of sensor systems for process control
- Exploitation of materials properties for applications in sensors
- Use of advanced measurement techniques for more cost effective examination of topology
- Improved energy control for industrial applications
- Improved non destructive testing methods for product assurance

3. APPLICATION OF MANUFACTURING TECHNOLOGIES

In this area the task is to identify and address the needs of manufacturing industry and particularly the less advanced sectors, many of which have a major part made up of SMEs. It is to be expected that modelling of physical processes will be a valuable instrument for progress. Also addressed is the challenge to the industries based on the use of flexible materials. Overall the work will mainly focus on product and process development transferring and adapting technology already used in other sectors. This should complement work in ESPRIT where IT systems for advanced manufacturing and CIM are being developed.

3.1 ADVANCING MANUFACTURING PRACTICES

There is a need to apply the principles of the best manufacturing practices already established in the leading sectors to others which have been slow to exploit the benefits that can be obtained in terms of business performance. Those sectors most likely to gain will include a high proportion of SMEs and have limited research and development capabilities themselves and so be dependent on the expertise and experience of other sectors.

The challenge is to identify common opportunities relevant to a significant number of companies in the Community and then, in conjunction with those having relevant expertise and experience, to develop the manufacturing processes which will enable them to improve the services they give their customers.

Modelling is essential in many areas of interest to estabished industries, such as the filling of complex injection moulds, particle formation in atomisers, positioning of sensors in condition monitoring systems, noise generation in machinery or the design of composite materials. However, modelling projects can only be justified in applied R&D when their application would be used as an effective industrial tool.

Goals

- Identifying means for improving manufacturing practices in specific sectors
- Transfer and adaptation of technology already used in other sectors

3.2 MANUFACTURING PROCESSES FOR FLEXIBLE MATERIALS

This activity addresses the challenge to the industries based on the processing and use of flexible materials including textiles, leather, non woven products, composites and packaging materials. Their importance is well illustrated by the Community's textile and leather related industries where some 3.5 million people are employed.

The clothing industry illustrates the problems of these industries. Its manufacturing processes deliver very large batches of similar products, but often at a price not competitive with the rest of the world. The long runs, high stocks and long lead times are no longer applicable to today's markets where the competition is worldwide. Clothing retailers have to be able to carry the right amount of the latest style. No longer is it acceptable to have the lead times of 6 months or even longer characteristic of many of today's clothing manufacturers, to go from design through selection of fabric, cutting, assembly and batch preparation. Uncertainties associated with long lead times result in considerable waste at all stages of the process, from ordering of too much raw material, through high work in progress to unsold stocks of finished goods. The challenge for the textile suppliers is to provide short delivery of small batches having reproducible dyes, finishes and properties.

In the clothing industry about 80% of production comes from SMEs, many of which have limited technical capabilities. The transfer and further development of technology already used in other sectors is seen as an important means of meeting their needs. Where appropriate, prototype developments might be demonstrated to potential users to keep them informed of emerging technologies.

Though the clothing industry has been used to illustrate the R&D opportunities, there is much in common with other, but quite different, applications in the physical processes involving flexible materials used in the packaging, meat processing and composite material manufacturing industries.

Goals

- Increased process flexibility
- Reduce waste of material
- To improve process and product quality

4. TECHNOLOGIES FOR MANUFACTURING PROCESSES

Improved techniques for shaping, joining and assembly, surface treatment, chemical processes and particle technology are fundamental needs for industry. Advancement of these processes is essential for securing manufacturing competitiveness.

4.1 SURFACE TECHNIQUES

Surface treatments vary considerably in nature and are applied across industry to a very wide range of materials for a wide variety of reasons, including improving resistance to wear, corrosion and high temperatures. In the case of corrosion it has been estimated that the costs of its prevention and effects amount to about 4% of Gross National Product in industrial countries. Similar figures can be given for wear. Such information indicates the scale of the problem, although the scope for cost-effective amelioration may be considerably less.

In almost all surface treatment systems, quality assurance, condition monitoring in service and control of the treatment process are very weak areas. For example, there are no satisfactory tests for the adhesion of coatings or coating quality in general. Because of the variety of applications, materials and environments, research work on a surface system has to be applications driven and recognise that there can be major problems in scaling up laboratory scale techniques.

The selection of the best system should be assisted by the increasing emphasis on the understanding of the degradation of materials. This requires the synergistic appreciation of environmental, stress and ageing issues. With a better understanding of the way in which surface systems behave, it should be possible to model systems to optimise selection. With some exceptions, such as in parts of the process industry, it is unlikely that existing knowledge is sufficiently complete to support the use of expert systems which would bring enough benefit to others to justify their development costs. Development of such a knowledge here, but not the mere collection of data, should be a further topic for development.

Overall this is an area where collaboration is needed to bring complementary expertise together and to ensure that equipment suppliers and users, which include many SMEs, are able to integrate the different technologies into cost-effective applications making use, as appropriate, of the advanced information handling technologies developed elsewhere.

Goals

- Cost-effective surface treatments for industrial applications
- Techniques for quality assurance and control of the treatment process

4.2 SHAPING, ASSEMBLY AND JOINING

Technologies for shaping, assembly and joining are fundamental to manufacturing industry. Many of these technologies are regarded as mature with scope for development being limited to changes necessary for their incorporation into computer integrated manufacturing systems. However, ever increasing demands for improved performance including high precision and faster operation, and the availability of more advanced materials both to be treated and also for use in the treatment process, challenge conventional practice.

As the programme progresses the need to improve methodologies for shaping processes and assembly will be developed. For this purpose shaping is taken to mean component processing techniques including forging, moulding and cutting and particularly those approaching near net shape.

In the area of joining, besides meeting more stringent technical requirements, an overriding priority is to reduce fabrication costs in all the major industrial areas, e.g. power generation, process plant, petro chemical, offshore hydrocarbon extraction, transportation, civil engineering, automobiles and construction plant. For example, manual metal arc welding, whilst offering considerable flexibility and tolerance in use, has low productivity and is being progressively replaced in many applications by alternative and particularly more automated processes such as those being developed in ESPRIT which include seam tracking, adaptive control and sensing when geometrical changes occur in the joint. These technologies are equally applicable to adhesive bonding.

Adhesive bonding, in addition to providing an alternative to welding, has opened up new approaches to joining, particularly suited to the assembly stage and the joining of dissimilar materials. Improvements in the speed and control of curing, together with wider operating temperature ranges would be welcome.

An associated problem to joining is the limited reliability of the non destructive inspection methods used to evaluate the weld soundness and its behaviour in service, an area where physical principles require development to allow better reliability of results and service predictability.

In certain manufacturing industries, where there is a large throughput of repetitive fabrication, the use of friction welding or the power beam processes such as electron beam and laser may be practicable and economic but their inflexibility, high capital costs and often poor stability and reliability outweigh their general use.

In the case of laser systems for materials processing, the laser itself is of low efficiency and often there is poor conversion efficiency at the workpiece where there is little understanding of the interaction of the beam with the target.

Lasers are suited to a limited range of applications and it is important that research reflects their needs. This will pull together the eventual users - to ensure that a cost-effective solution can emerge - with potential manufacturers and the reservoirs of expertise in research organisations.

Goals

- Improved methodologies for shaping processes and assembly
- Improved joining techniques to improve reliability and reduce defect levels
- Methods for testing welded and bonded joints to improve reliability of results and service predictability
- Design methodology for joining
- Better understanding of beam/workpiece interactions for industrial power beam processes

4.3 CHEMICAL PROCESSES

There are many aspects underpinning the effectiveness and usefulness of chemical manufacture which will only result if there is collaboration between chemical manufacturers, users and suppliers of new technology or expertise.

Improved predictability of chemical reactions will help in optimising specificity, safety and energy conservation. This is a vital area where tools can be of wide applicability but where, as in the case of chemical and electrochemical sensors, the European industry is under considerable pressure from Japan and the USA.

The effectiveness of many chemical reactions depends on the use of catalysts. The supply is generally local and Europe is generally strong but needs to maintain and improve its position. Most catalysts are of high specificity and so their development is generally inappropriate for collaborative research. There are, however, basic problems related to the performance of catalysts such as poisoning which, if solved, would underpin the competitive edge of the European catalyst manufacturers and users.

Separation technologies are vital elements of many industrial processes. In addition to opportunities to develop operating efficiency, the incentive for new technology in this area may come from a cost effective response to environmental pressures such as those associated with effluent control. Though many separation processes are of importance, membrane technology is currently identified as having a particular potential for development.

In the face of strong competition, Europe has been slipping behind in membrane innovation. In terms of installed capacity, desalination is by far the largest application area. The size of the world market for membranes is estimated to be about 400 mio ECU/year. This is likely to grow significantly in the future as new applications for membranes are identified, such as gas filtration.

New membranes are very expensive to develop and, for some types, can typically take up to 10 years. Few users are willing to make such an investment, so development is left to the membrane makers. Many of these are unwilling to make such long term and high risk investments. Development tends to be highly experimental reflecting the poorly categorised media to be processed and the very limited understanding of membrane separation processes.

Membrane processes often have to trade off separation efficiency against flux rate. Rarely does a membrane behave in the anticipated way and fouling problems can severely limit life. There is considerable scope for optimising the design of the membrane systems, such as to enhancing turbulence at the membrane surface and also techniques to inhibit fouling.

Goals

- Improved predictability and yield in chemical processes
- Membrane materials with improved characteristics
- Improved performance of membrane processes
- New systems for separation in hostile environments

4.4 PARTICLE AND POWDER PROCESSES

Particles, whether in the form of powders, dusts, gaseous or suspensions, or porous media, are found in almost every area of manufacturing industry. Problems with their production, separation, stability and categorisation limit their application in both quality and quantity, such that alternative and much more expensive solutions have to be employed.

In general, the Japanese are in the lead on the novel approaches to particle production and application. Europe, like the US, has its strengths but has not been so good at bringing together complementary expertise to tackle common problems. There is a need to bring together the complementary expertise from the different interests - the material suppliers, the users, the instrument makers (often small specialists), the process plant manufacturers and the innovators from universities and research organisations.

There is a series of common problems which are found in many very different particle systems and these include the inability to fully categorise particles - not only in-process but also for batch sampling. There is also poor efficiency and size control within many conventional processes - such as milling and classification. There are also many problems in maintaining even flow and distribution in the flow of powders and suspensions. Serious difficulties also arise when separating suspensions, particularly at high temperatures or when the medium is of high viscosity. In contrast, the improved stability of colloids, including micro-emulsions, would be advantageous in many sectors.

The scale of the powder technology industry is illustrated by the level of production in the US - about 270,000 tonnes (of which 200,000 tonnes is stainless steel) per year valued, in parts and products, at about 2 billion ECU. Japan and Europe produce about 1 billion ECU each. The value is illustrated by the value of steel semi-finished powder and metallurgical components being between 20-50 ECU/kilo, while ceramic powder parts can cost 2000 ECU/kilo.

Overall it is an area where international competition is very strong, driven in part by the requirements and spin-offs, such as vacuum technology, from the space programmes. Though not in the lead overall, Europe has strengths in some process areas.

There are a number of areas, such as aero and automative engines, magnets, tools steels and electronic materials, where advanced powder materials could meet industrial requirements, though in each the technology is limiting the achievement of potential benefits.

Better products will come from improvements in powders and their processing. There is sufficient understanding of the powder categorisation and the physics and chemistry of the processes involved but, to date, there has been a limited application of modelling techniques to address the problems. It is likely that modelling techniques could assist in improving the performance of powder production (for example, the yield of atomisers is typically around 60%), pressure transmission in compaction, and sintering. The high capital cost of powder production and processing equipment makes the need for an improved understanding of the processes necessary.

For the future, the competitive edge will reflect advances in process techniques to supply and compact smaller quantities of high quality powder. Movement in this direction would allow smaller companies to exploit the potential of powder technology.

Goals

- Improved techniques for particle production to optimise product shape, structure and stability
- Cost-effective techniques for particle categorisation and process performance
- Better approaches to handling and separation
- Cost effective routes for small lots of high quality powder

ANNEX B

OPINION OF THE MANAGEMENT AND COORDINATION ADVISORY COMMITTEE ON INDUSTRIAL TECHNOLOGY

After having examined and discussed in depth the draft communication from the Commission to the Council and to Parliament concerning a Research and Technological Development Programme of the EEC in the fields of industrial manufacturing technologies and advanced materials application (BRITE/EURAM) (1989-1992), dated 3 May 1988 (CGC-IT/88/20);

After having been informed of the preliminary conclusions and recommendations expressed by the panel of external experts in charge of the evaluation of the on-going BRITE programme (1985-1988);

The Management and Coordination Advisory Committee on Industrial Technology delivered the following opinions and suggestions at its meeting on 30 May 1988.

The Committee having had a joint meeting with the CGC - Raw Materials and Other Materials :

- subscribes to the general approach proposed for the new programme and recognises the relevance of the objectives set out in it, in particular subscribes to the importance of the possibility of inclusion of Focussed Fundamental Research in all areas of the programme;

- approves the scientific and technical content of the new programme, which comprises four technical areas: advanced materials technologies, design and assurance of products and processes, manufacturing systems and technologies for manufacturing processes;

- recommends that the draft programme be approved and adopted by the Commission in good time for the Council decision to be taken within the deadline needed for its implementation from 1 January 1989;

- recommends that 500 mio ECU should be made available for the implementation of the programme.

ANNEX C

OPINION OF CGC RAW MATERIALS AND OTHER MATERIALS

After having examined and discussed in depth the draft communication from the Commission to the Council and to the Parliament concerning a Resarch and Technological Development Programme of the EEC in the fields of industrial manufacturing technologies and advanced materials application (BRITE/EURAM) (1989-1992), dated 3 May 1988 (CGC-IT/88/20);

After having been informed of the preliminary conclusions and recommendations expressed by the panel of external experts in charge of the evaluation of the on-going BRITE (1985-1988) and EURAM (1986-1989) Programmes;

The Management and Coordination Advisory Committee on Raw Materials and Other Materials delivered the following opinion and suggestions at its meeting on 30 May 1988.

The Committee, having had a joint meeting with the CGC-Industrial Technology:

- subscribes to the general approach proposed for the new programme and recognises the relevance of the objectives set out in it;
- approves in general the scientific and technical content of the new programme, which comprises four technical areas: advanced materials, design and assurance of products and processes, manufacturing systems and technologies for manufacturing processes;
- recommends that the Commission, after consultation with the CGC, should take into account the conclusions of the above mentioned evaluations in the implementation of the programme;
- recommends that the amount set aside for focussed fundamental research could be increased to as much as 20% of the total budget in each research area when it appears necessary, for progress to be made;
- recommends tht the Commission be flexible in its approach to modalities so that the programme will be seen as dynamic and capable of adapting to meet the changing needs of the Community. It further recommends that the CGC-Materials be consulted at regular intervals in this regard;
- recommends that the BRITE/EURAM Programme should not overlap with other Community programmes and, in particular, with ESPRIT and SCIENCE in the area of superconductivity;
- recommends that a minimum of 500 mio ECU should be made available for the implementation of the programme;
- recommends that the draft programme be approved and adopted by the Commission in good time for the Council decision to be taken within the deadlines needed for its implementation from 1 January 1989.

A majority of the delegations of the CGC recommended that the participation of universities and similar organisations in any project of the BRITE/EURAM Programme should be financed up to 100% of their marginal costs.

The CGC welcomes the technical balance of the programme. It notes that the Commission proposes to strengthen the proposal by reference to the technical comments of the CGC.

PROPOSAL FOR
A COUNCIL DECISION
ADOPTING A SPECIFIC RESEARCH AND TECHNOLOGICAL DEVELOPMENT PROGRAMME OF THE EUROPEAN ECONOMIC COMMUNITY IN THE FIELDS OF INDUSTRIAL MANUFACTURING TECHNOLOGIES AND ADVANCED MATERIALS APPLICATIONS (BRITE/EURAM)
(1989 - 1992)

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Economic Community and, in particular, Article 130 Q (2) thereof,

Having regard to the proposal from the Commission[1]

In cooperation with the European Parliament[2],

Having regard to the opinion of the Economic and Social Committee[3],

Whereas Article 130 K of the Treaty stipulates that the Framework Programme shall be implemented through specific programmes developed within each activity;

Whereas by its Decision 87/516/Euratom, EEC[4], the Council has adopted a framework programme of Community research and technological development (1987 - 1991) providing for activities in the field of science and technology for manufacturing industry and advanced materials;

Whereas that Decision provides that a particular aim of Community research shall be to strengthen the scientific and technological basis of European industry and to encourage it to become more competitive at the international level and that Community action is justified where research contributes inter alia to the strengthening of the economic and social cohesion of the Community and the promotion of its overall harmonious development, while being consistent with the pursuit of scientific and technical quality; whereas it is intended that the BRITE/EURAM programme should contribute to the achievement of these objectives;

Whereas Council Decision 85/196/EEC[5] decided on a first multiannual research and development programme for the European Economic Community in the fields of basic technological research and the application of new technologies (BRITE, 1985 - 1988);

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[1] OJ N°

[2] OJ N° , OJ N°

[3] OJ N°

[4] OJ N° L 302, 24.10.1987, p. 1

[5] OJ N° L 83, 25.03.1985, p. 8

Whereas Council Decision 86/235/EEC[6] decided on a research programme on materials (raw materials and advanced materials) (1986-1989);

Whereas it is necessary to react adequately to the interest shown by the industry in transnational cooperation;

Whereas it is necessary to involve small and medium-sized enterprises to the maximum extent possible in the development of industrial technologies by taking into account their particular and specific requirements while respecting the objective of the scientific and technical quality of the programme;

Whereas it is necessary to underline the industrial and transnational nature of the programme by requiring applied research projects with at least two industrial partners from two different Member States;

Whereas it is necessary to ensure the industrial nature of the programme by requiring focussed fundamental research projects with industrial endorsement from at least two independent enterprises;

Whereas the participation of organizations from EFTA countries in industrially-oriented R & D projects, under appropriate conditions, may contribute to the competitiveness of manufacturing industry as a whole;

Whereas it is in the Community's interest to consolidate the scientific and technical basis of European research by means of the involvement to a greater extent of the EFTA countries in certain Community programmes, particularly in programmes involving cooperation in research and development of basic industrial technologies including advanced materials;

Whereas the implementation of concerted actions in the COST framework is an essential element to complement industrially-oriented R & D projects;

Whereas the Scientific and Technical Research Committee (CREST) has been consulted on the following measures,

HAS ADOPTED THIS DECISION :

ARTICLE 1

A specific research and technological development programme for the European Economic Community in the fields of industrial manufacturing technologies and advanced materials applications , as defined in Annex I, is hereby adopted for a period of four years, from 1 January 1989.

ARTICLE 2

The funds estimated as necessary for the execution of the programme amount to 439,5 Mio ECU,including expenditure on staff whose cost shall not exceed 4,5 % of the Community contribution.

ARTICLE 3

1. Detailed rules for the implementation of the programme and the rate of the Community's financial participation are set out in Annex II.

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[6] OJ No. L 159, 14.06.1986, p. 36

ARTICLE 4

1. In the third year of the programme implementation, the Commission shall undertake a review of the programme and report to the Council and to the European Parliament on the results of this review, together, if necessary, with any proposals for modification or prolongation.

2. An evaluation of the results achieved shall be conducted before the end of the programme by the Commission which shall report thereon to the Council and the European Parliament.

3. The abovementioned reports shall be established having regard to the objectives set out in Annex III to this Decision and in conformity with the provisions of Article 2(2) of the Framework Programme.

ARTICLE 5

1. The Commission shall be responsible for the execution of the programme and shall be assisted in its implementation by the Management and Co-ordination Advisory Committee (CGC) on Industrial Technology, set up by Council Decision 84/338, Euratom, ECSC, EEC[7].

2. The contracts entered into by the Commission shall regulate the rights and obligations of each party, including the methods of disseminating, protecting and exploiting the research results.

ARTICLE 6

1. Where Framework Agreements for scientific and technical cooperation between non-Community European countries and the European Communities have been concluded, organizations and enterprises established in those countries may, under appropriate conditions to be defined by the Commission, become partners in a project undertaken within the programme. For each such project, the Committee referred to in Article 5 shall assist the Commission in defining those conditions.

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[7] OJ No L 177, 4.7.1984, p.25

2. No contractor established outside the Community who participates as a partner in a project undertaken within the programme shall be entitled to Community financing intended for the programme. The contractor will contribute to general administrative expenses.

ARTICLE 7

The Commission shall ensure that procedures are set up to allow for appropriate cooperation with COST activities related to the areas of research covered by the programme, by ensuring regular exchanges of information between the Committee referred to in Article 5 and the relevant COST Management Committee.

ARTICLE 8

This Decision is addressed to the Member States.

Done at

For the Council,

The President.

ANNEX I

TECHNICAL ANNEX

1. ADVANCED MATERIALS TECHNOLOGIES

The work in this area will focus on the development of improved or new materials and material processing for a wide range of possible applications except those directly related to IT covered in ESPRIT[1].

Including in particular :

1.1. Metallic Materials and Metallic Matrix Composites

Goals

- Extended working life of components
- Higher operating temperatures for increased thermal efficiency
- Better and more effective material processing techniques

1.2. Materials for Magnetic, Optical, Electrical and Superconducting Appications

Goal

- Improved materials and materials processing for optical, magnetic, electrical and superconducting applications

1.3. High Temperature Non-metallic Materials

Goals

- Design methodologies for products based on ceramics, glasses and amorphous materials
- Improved monolithic and ceramic composites and metal/ceramic interfaces for industrial applications
- Better processing techniques and quality control strategies

1.4. Polymers and Organic Matrix Composites

Goals

- Development of polymers for specific applications
- More cost effective process techniques for parts made from polymer and polymer matrix composites
- Design rules for the specification and manufacture of engineering polymers and composites
- New polymers with improved recycling attributes
- Improved product assurance techniques

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[1] Developments of materials already covered by ESPRIT are, for instance, dealing with magnetic, magneto-optical, optical thin films for sensors, recording media and heads, optical layers and specific materials for opto-electronics, ceramics and polymers for IC packaging and specific substrates, superconducting thin films for low current applications and devices.

1.5. Materials for Specialised Applications

Goal

- Improved materials and their processing for specialised applications

2. DESIGN METHODOLOGY AND ASSURANCE FOR PRODUCTS AND PROCESSES

The development of techniques to improve product quality and the reliability and maintainability of structures and manufacturing systems by clarification of the design aims for both product and process, and by refinement of the criteria against which the attributes are measured. The exploitation of materials for application in sensors, and the reduction in the whole life costs of sensors are also included in this section. This will complement work in Community IT programmes, where on-line control is treated, including monitoring and diagnostics, predictive maintenance and quality assurance.

Including in particular :

2.1. Quality and Reliability and Maintainability in Industry

Goals

- Improved performance measurement for manufacturing operations in a wide variety of industries
- Improved and more predictable physical and environmental behaviour of products
- Improved quality control strategies
- Design rules for reliability and maintainability of components, structures and systems including machinery operating under varying conditions

2.2. Process and Product Assurance

Goals

- Reduction of whole life costs of sensor systems for process control
- Exploitation of materials properties for applications in sensors
- Use of advanced measurement techniques for more cost effective examination of topology
- Improved energy control for industrial applications
- Improved non-destructive testing methods for product assurance

3. APPLICATION OF MANUFACTURING TECHNOLOGIES

Here the task is to identify and address the needs of manufacturing industry and particularly the less advanced sectors, many of which have a major part made up of SMEs. It is to be expected that modelling of physical processes will be a valuable instrument for progress. Also addressed is the challenge to the industries based on the use of flexible materials. The work will mainly focus on product and process development, transferring and adapting technology already used in other sectors. This should complement work in ESPRIT where IT systems for advanced manufacturing and CIM are being developed.

Including in particular :

3.1. Advancing Manufacturing Practices

Goals

- Identifying means for improving manufacturing practices in specific sectors
- Transfer and adaptation of technology already used in other sectors

3.2. Manufacturing Processes for Flexible Materials

Goals

- Increased process flexibility
- Reduce waste of material
- Improved process and product quality

4. TECHNOLOGIES FOR MANUFACTURING PROCESSES

Improved techniques for shaping, joining and assembly, surface treatment, chemical processes and particle technology are fundamental needs for industry. Advancement of these processes is essential for securing manufacturing competitiveness.

Including in particular :

4.1. Surface Techniques

Goals

- Cost-effective surface treatments for industrial applications
- Techniques for quality assurance and control of the treatment process

4.2. Shaping, Assembly and Joining

Goals

- Improved methodologies for shaping processes and assembly
- Improved joining techniques to improve reliability and reduce defect levels
- Methods for testing welded and bonded joints to improve reliability of results and service predictability
- Design methodology for joining
- Better understanding of beam/workpiece interactions for industrial power beam processes

4.3. Chemical Processes

Goals

- Improved predictability and yield in chemical processes
- Membrane materials with improved characteristics
- Improved performance of membrane processes
- New systems for separation in hostile environments

4.4. Particle and Powder Processes

Goals

- Improved techniques for particle production to optimise product shape, structure and stability
- Cost-effective techniques for particle categorisation and process performance
- Better approaches to handling and separation
- Cost-effective routes for small lots of high quality powder

ANNEX II

RULES FOR THE IMPLEMENTATION

Participants may be industrial organizationss, research institutes and universities, established in the Community. The Community contribution shall not normally exceed 50% of total expenditure, the remainder in principle to be provided by the industrial participants. Industrial participants shall include any research institute which is funded entirely or mainly by industrial organisations.

Industrial Applied Research

The principal form of support for industrial applied research of a pre-competitive character will be through cost shared action. The conditions for participation will be .that in each project there will be 50 % financing from industrial partners and at least two legally independent industrial enterprises from different Member States per project. To be classified as an independent enterprise, research organisations should normally receive the industrial 50 % in direct payments from nominated companies involved in steering the project.

Recognising the important role of SMEs in developing the manufacturing base of the Community and the merits of their participation in the programme, the Commission is considering, in conjunction with IRDAC, how best research organisations can act within the programme as a focus for meeting the R & D needs of SMEs. Projects should include at least 10 man years of activity, the realistic minimum for an effective collaborative project, and the total project costs should fall in the range 1-3 mio ECU. Subsidaries of multinational companies based outside the Community may participate if the R & D and exploitation takes place within the Community.

Focussed Fundamental Research

Focussed fundamental research projects shall involve at least two partners established in different Member States. When the partners are universities or research institutes, the project should be endorsed by at least two legally independent industrial enterprises and the Community could bear up to 100% of the marginal costs of such partners. Projects should include at least 10 man years of activity and fall in the range of 0.4 to 1 mio ECU total project costs.

Feasibility Awards for SMEs

The Commission will introduce a pilot scheme of Feasibility Awards aimed at assisting SMEs establish the feasibility of a device, process or concept as a means of enhancing their stature in finding a partner in a subsequent call for proposals under the shared cost action. The Commission will support up to 75 % (maximum 25.000 ECU) of the cost of research lasting up to six months. High standards of evaluation will ensure that the awards are highly competitive and recognised as prestigous. This scheme will be co-financed by the Task Force SME.

Coordinated Activities

In cases where work, supported by national funds or entirely privately funded is already going on, the Commission's role may be limited to simply organising the coordination of the work and the Community funding confined to covering the cost of such coordination activities. However, in certain cases where it is clear that strategically important work requires more than simple coordination, the Commission could, in consulation with CGC, consider a higher Community funding.

ANNEX III

PROGRAMME EVALUATION CRITERIA

The results against which the programme should be evaluated must reflect its objectives and the wider objectives of the Framework Programme.

1. As the principal objective is to enhance the competitive position of the Community's manufacturing industries, the evaluation should determine:

   - the extent to which the projects were selected against credible and measurable industrial criteria;

   - the extent to which substantial product or process development has resulted from the work supported.

2. A further objective is to encourage transfrontier collaboration in strategic industrial research. The evaluation should determine:

   - to what extent, before and after project completion, there were continuing links between partners for research, development, manufacturing, marketing or staff formation.

3. A further programme objective is to encourage transfer of technology across Community frontiers and between sectors, particularly those with a high predominance of SMEs. The evaluation should determine:

   - the extent to which SMEs have exploited technologies and new materials arising from successfully completed projects;
   - the extent to which accomplishments are protected by patent action or are disseminated to raise awareness in the European research and technology community.

4. In the wider context of the Framework Programme, the evaluation should determine:

   - the extent to which the projects have contributed to the harmonisation of the Community by reducing the technical barriers to trade.

The evaluation will be undertaken by independent evaluators.

III. FINANCIAL RECORD

Research and Technological Development programme of the EEC in the field of industrial manufacturing technologies and advanced materials applications (BRITE/EURAM) .

1. Relevant budget heading

   Chapter 73 - Item 7332 - BRITE - EURAM

2. Legal basis

   EEC Treaty Article 130 Q § 2

3. Description and justification of the programme

   This integrated programme is one of the components of the Framework programme for Community activities in the field of research and technological development (1987 - 1991) and is included in it under the headings :

   - science and technology for manufacturing industry (3.1)(300,0 Mio ECU);
   - science and technology for advanced materials (3.2) (139,5 Mio ECU).

   The programme addresses industrial organizations, research institutes and universities; special considerations will be given to projects involving SMEs, in order to ensure their adequate participation in the programme.

   It has been widely agreed that research in manufacturing technologies is an essential element for the competitiveness of community manufacturing industry. The Community can assist in increasing the competitiveness by stimulating cooperation in industrial oriented research at the precompetitive stage across the frontiers, between different industry sectors and between industry, research institutes and academic institutions.

   The programme also contributes to the competitiveness of established and new industrial sectors in developing high-quality advanced materials, as well as improved processing techniques for manufacturing them.

   Another purpose is to increase the level of cooperation between laboratories of different Member States and, in particular, to offer the opportunity to laboratories from all Member States to participate actively in a broader materials science and technology programme.

   The programme covers the following fields :

   - Advanced materials technologies
   - Design methodology and assurance of products and processes.
   - Application of manufacturing technologies
   - Technologies for manufacturing processes.

4. Type of expenditure

   a. The major part of the expenditure will be committed through cost shared contracts.

b. In some areas of materials development industrial progress is hindered by weakness in basic science. Hence, up to 20 % of the budget for the materials field will be made available for such focussed fundamental research. Transnational cooperation would be required but partners would not need to include an independent enterprise. However, to ensure the industrial focus, there should be an industrial endorsement by nominated individuals from at least two independent enterprises. Each would be required to commit at least two days per year in steering the project. Projects should include at least 10 man years of activity and fall in the range of 0.4 to 1 mio ECU total project costs.

c. The Commission is also introducing a pilot scheme of Feasibility Awards aimed at assisting SMEs establish the feasibility of a device, process or concept as a means of enhancing their stature in finding a partner. The Commission would support up to 75 % of the cost of research up to 25.000 ECU lasting up to six months. The Task Force SME will also support the first call of this pilot scheme of the Feasibility Awards. The financial support anticipated for 1989 by the Task Force SME is 500.000 ECU.

d. Part of the total budget will be spent on coordinated actions.

e. In addition, demonstration projects will be supported. Their modalities will be determined as projects within the first BRITE and EURAM programmes near completion.

5. Financial implications

Appropriations for commitment (MECUS)

	1989	1990	1991	1992	1993*	TOTAL
Personnel	4,0	4,9	5,1	5,4	-	19,4
Administration	1,3	2,9	3,4	3,5	-	11,1
Contracts	69,9	100,1	113,9	125,1	-	409,0
TOTAL	** 75,2	107,9	122,4	134,0	-	439,5

Appropriations for payments (MECUS)

	1989	1990	1991	1992	1993*	TOTAL
Personnel	4,0	4,9	5,1	5,4	-	19,4
Administration	1,3	2,9	3,4	3,5	-	11,1
Contracts	18,8	45,5	75,1	100,7	168,5	409,0
TOTAL	24,1	53,3	84,0	109,6	168,5	439,5

* = 1993 and following years

** = In order to cover the personnel and administration expenses, 2.8 mio ECU have been incorporated within the "old BRITE" budget, but to be reallocated with the "BRITE-EURAM" budget as soon as it is approved

IV. COMPETITIVINESS AND EMPLOYMENT IMPACT STATEMENT ON SMEs

1. The main reason for introducing the measure

The programme is aimed at promoting collaborative technological research to enhance the precompetitive position of the Community's manufacturing industries, in particular SMEs. An important purpose of this European Community programme is to bring together complementary research of industrial firms, research institutes, universities and other organizations from different countries in the Community through transnational cooperation.

2. Features of the business in question

The programme is directed at European manufacturing industries where there is a need to improve technology in order to enhance competitive performance.

This programme has been preceeded by the first BRITE programme with two calls for proposals, 1985 and 1987, and the EURAM programme with a call for proposals in 1987.

In the BRITE programme, a total of 939 proposals with transnational cooperation, involving 3.969 participants, were received by the Commission. 205 projects are now being supported : 60 % of the participants are from industry , 21 % from research institutes and 19 % from universities.

The participation of SMEs in the BRITE programme increased from 30 % of industrial participants in the first round to 42 % in the second round. Consequently 50 % of projects included at least one SME in the first round increasing to 65 % for the second.

EURAM had only one call for proposals in 1986. The Commission received a total number of 298 proposals with transnational cooperation involving 904 individual partners. After the selection procedure 84 projects involving 302 partners were retained with an average partnership of 3.

The participation of industry in EURAM was evident in a large proportion of the projects; 44 % of all partners involved came from industry, and included a significant share of SMEs.

3. Obligations imposed directly on business

The BRITE and EURAM programmes have stimulated cooperation in manufacturing industry and universities at the European level which will contribute to the achievement of a Common Market, the unification of the European scientific and technological area by helping to break down the traditions of tight relationships within Member States and thus the more rational use of the research resources available.

Obligations for participation in projects will ensure and endorse the industrial nature of the BRITE/EURAM programme :

a. industrial applied research (i.e. transnational cooperation, 50 % industrial financing, two independent industrial partners from different Members State per project);

b. focussed fundamental research (transnational cooperation, two partners from universities or research institutes, endorsement by industrialists from at least two independent enterprises)

4. **What indirect obligations are national, regional or local authorities likely to impose**

By implementing this draft council decision no action is required by national governments or local authorities.

5. **Are there any special provisions in respect of SMEs ?**

Feasibility Awards for SMES

The Commission will introduce a pilot scheme of Feasibility Awards aimed at assisting SMEs establish the feasibility of a device, process or concept as a means of enhancing their stature in finding a partner in a subsequent call for proposals under the cost shared action. The Commission would support up to 75 % of the cost of research up to 25.000 ECU lasting up to six months. High standards of evaluation will ensure that the awards were highly competitive and recognized as prestigous.

6. **What is the likely effect on :**

a. The competitiveness of business

As the programme is aimed at precompetitive research, not leading directly to new commercial products or processes, there will be no immediate effect on the competitiveness of businesses.

In the longer term the programme is directed at improving the technological competences of European industry in general and of small and medium sized enterprises in particular. It must be pointed out that a number of projects in the programme deal with technical problems specific to SMEs. The majority of the participants in these projects are SMEs. The results of the projects, if successful, will be of real benefit to SMEs in the longer term.

When a choice has to be made between projects of similar technical merit and likely industrial impact, preference will be given to those projects involving SMEs.

The advantages for SMEs in participating in the programme is that all signatories to a contract are treated on an equal footing, so that even with a relatively small contribution to make, a contractor has the right of full access to the foreground information.

As the technical work develops, dissemination of information about the research results will commence.

b. On employment

The effects on employment (in as much as these can be measured) of the programme are and will continue to be of an indirect and positive nature in the immediate term. The first BRITE and EURAM programmes have already encouraged about 250 SMEs to participate in research and development projects thereby enhancing their technological capabilities and their international market prospects. Without BRITE and EURAM such firms would not have the funds available for research activity on the scale now possible nor would they benefit from international collaboration.

7. **Have the relevant representative organizations been consulted ?**

The Industrial Research and Development Advisory Committee (IRDAC), in which the European Trade Union Confederation (ETUC), the European Centre for Public Enterprises (ECPE), the Union of Industries of the European Community (UNICE) and the Federation of European Industrial Cooperative Research Organizations (FEICRO) are represented, has been consulted during the preparation of the new programme, and has been consulted on the technical subjects of the programme.