

**Medium-term guidelines for the ECSC programmes of technical steel research and of steel pilot/demonstration projects (1991 to 1995)**

(90/C 252/03)

**I. Introduction**

The ECSC technical research activities consist of two Community programmes of support for collaborative research and technological development undertaken pursuant to the terms of Article 55 of the Treaty which states that the Commission 'shall promote technical and economic research relating to the production and increased use of coal and steel and to occupational safety in the coal and steel industries'.

The specific programmes are concerned with steel research and with steel pilot and demonstration projects respectively, promoting collaboration between the steel industry and its research laboratories on the one hand and complementary centres of expertise in industry, universities and research institutes on the other.

Guidelines for each programme are established periodically to reflect the industry's changing scientific and technological priorities. It has now been decided to establish common guidelines for these activities for the forthcoming period up to 1995. Thus, these guidelines are an extension of those for steel research for 1986 to 1990<sup>(1)</sup> and supersede those for the pilot and demonstration projects programme for 1988 to 1992<sup>(2)</sup>.

The objectives and technical orientations defined here correspond to the Commission's policy for the steel sector and, in particular, to the contribution ECSC research has to make in sustaining the industry's competitiveness outlined in the recently established 'General Objectives Steel 1995'<sup>(3)</sup>.

Close coordination will be maintained with the other ECSC research programmes on questions relating to the environment and energy utilization.

**II. Objectives**

To sustain and develop the European steel industry's international competitiveness in an industrial and commercial context, it is necessary to continue to undertake R & D in the following three major directions:

- (a) improve quality and reduce production costs;
- (b) sustain the outlets for steel in its traditional markets and the development of new markets;
- (c) adapt production conditions to meet increasingly stringent environmental requirements.

**1. Actions concerned with production processes**

This aspect of production costs can be illustrated by differences in productivity. At present, in Europe, for the hot metal route 3 to 5 man-hours per tonne of standard rolled products are required whereas in certain other countries the level is nearer to 2 man-hours per tonne.

R & D effort will try to optimize existing production methods and develop new techniques to produce faster, better and at less cost, by:

- (a) reducing the processing time, improving the technical reliability of the processing plant, improving output quality at the various processing stages, improving the flexibility of the processing line;
- (b) gaining a more detailed knowledge of the physical and chemical phenomena of multiphase systems as well as the development of processes giving new and improved properties;
- (c) continuing the effort to achieve economies in the consumption of raw materials, in manpower and in energy consumed in producing steel as well as choosing the most appropriate raw materials and form of energy.

**2. Actions concerned with steel products**

If the impact of the substitution of steel by alternative materials has so far scarcely been noticeable, advances in materials technology could significantly change this situation in the future. The phenomenon of substitution also applies to the replacement of one steel grade by another: alloy steels/microalloyed steels, uncoated steels/coated products, cold rolled products/hot rolled products, etc.

<sup>(1)</sup> OJ No C 294, 16. 11. 1985.

<sup>(2)</sup> OJ No C 317, 28. 11. 1987.

<sup>(3)</sup> COM(90) 201 final. Brussels, 7. 5. 1990.

R & D effort will try to optimize the properties of existing products and bring to the market products which are at present being developed. This will be achieved by:

- (a) reducing the time to produce the steel products demanded by the client, delivering better information to the customer, promoting adequately the new products;
- (b) supplying the customers products with consistent quality and reliability which can be immediately utilized, developing of quality assurance, partnership with the steel users in the utilization of steel;
- (c) development of new uses for steel and the use of new steel grades;

### 3. Actions concerned with the environment protection

In order to keep its place in a more and more demanding industrial context, the steel industry must continue its efforts towards the creation of working conditions which minimize environment pollution (water, air, noise, etc.), notably:

- (a) by improving the environmental control techniques for existing processes;
- (b) by developing new clean technologies for production and processing of steel;
- (c) by upgrading the value of by-products to reduce steelplant wastes.

The technological innovation shall be done under the best possible economic conditions from the point of view of investment and operational costs.

### III. Technical areas

Technology in the steel sector is traditionally divided into two main areas: 1. the production processes such as ironmaking, steelmaking, casting, rolling and finishing and 2. products and their utilization.

In fact, processes and products are closely bound together. Progress in a process has a direct impact on production costs and product quality, and in the same way the development of the products leads to improvements in the manufacturing process or in the search for new processes.

In the light of our present knowledge, the technical areas, where priority should be applied at the European level, are presented below:

#### 1. Processes

The main R & D themes defined at present as priorities and capable of adapting to any new situation are mentioned below. They are illustrated by a limited number of examples.

##### A. *Reduction in the cost of energy consumed and in its effect on the environment*

Energy consumption has two aspects: firstly, it is the most important cost factor in the production of crude steel and secondly, it affects the environment.

These two aspects explain the priority given:

- to energy savings, and
  - to substitution between different forms of energy,
- and may be illustrated by the following examples:
- in blast furnaces, partial replacement of coke by coal of appropriate quality and cost and/or by other forms of energy,
  - in electric arc furnaces, savings of electrical energy by use of coal and of oxygen, savings in electrode consumption,
  - by improvement of the physical quality and chemical composition of scrap as well as enhancement of its consistency,
  - by reduction of thermal losses, recovery of sensible heat at the production various stages.

##### B. *Development of treatments for the secondary refining of liquid metal*

The treatment of liquid metal outside the principal furnaces (treatment of hot metal outside the blast furnace, of steel outside the converter or the electric arc furnace) provides a solution to several problems: operating performance of steel plant facilities both up and down stream in the production line, diversity of the production programme, increasing demands from the customers concerning quality and delivery deadlines.

Typical examples of progress in this field are:

- new methods of hot metal treatment at the blast furnace, at an intermediate treatment station, or at the steelplant itself,
- development of processes to adjust the temperature, the composition and the cleanliness of the steel before solidification.

#### C. *Improvement of measuring and analysis techniques*

The mastery of the steelmaking processes and the processes of working steel depend on numerous measurements and precise analyses which have to be carried out rapidly and, to an increasing extent, continuously. New techniques have to be developed taking into account scientific and technical progress.

Examples are:

- continuous measurement and analyses in the blast furnace,
- continuous measurement and analyses of the liquid metal during the production of steel and during continuous casting,
- examination of the product geometry, internal soundness and the state of the surface during the various stages of metal processing such as casting, hot and cold rolling, surface treatment and finishing.

#### D. *Modelling of Production Processes*

Models are powerful tools which permit a better control of the working of plant installations and their capability to adapt to various working conditions, like those necessary for 'just in time' deliveries.

Studies will be made leading to quantitative descriptions of the production processes for iron and steel, continuous casting, and the rolling and treatment of steel. The mathematical models will be developed in close liaison with experimental studies and will be checked for validity on industrial installations.

#### E. *Development of control, automation and robotization*

The objectives for R & D mentioned above indicate the need to measure and control parameters in a more continuous way, hence the need to develop further on-line monitoring techniques and process automation in addition to the robotization of labour-intensive and dangerous operations.

The R & D effort will be concerned also with the development of expert systems closely linked with real production conditions.

#### F. *Improvement in the reliability of installations*

The necessity for a modern industry like the steel industry to produce faster and better, in order to satisfy the ever more exacting demands of its customers, means that it must continue to improve the technical reliability of its installations. It must at the same time develop techniques to handle and to follow the data obtained all along the production chain, from the arrival of raw materials right to the final products leaving the works.

This implies among other examples:

- the setting up of modern maintenance methods,
- the development of plant capable of using these new maintenance methods,
- studies on methods of reducing the transitory periods in the continuous working of production installations.

#### G. *New processes for the making and shaping of steel*

These new processes, which will be studied at laboratory, pilot or demonstration levels, aim essentially at reducing the cost of production and capital investment, at improving the quality of the product, at improving working conditions and at improving the quality of the environment.

Several examples of this broad area are quoted below:

- smelting reduction at the industrial demonstration scale,
- technology to go directly from liquid steel to thin or ultra-thin products or near to their net shape,
- new processes for rolling, continuous treatment and finishing lines of steel.

#### H. *Improving environmental quality and up-grading the value of by-products*

The quality of the environment is an essential preoccupation of the steel industry, as is witnessed by the inclusion of this concern in many of the R & D themes mentioned above, be they concerned with improving existing processes or with the development of new processes.

The investment, operating and maintenance costs are high and could grow substantially as a function of the requirements which are set. This makes cooperation at the European level particularly necessary in R & D in the development of new clean production technologies and in the recovery, treatment and recycling of by-products and steel plant wastes.

## 2. Products

The R & D effort on products covers, primarily, the following principal sectors of steel use:

- Transport: automobile manufacture, aircraft construction, shipbuilding, railway construction.
- Energy Sector: power station techniques, mining techniques, energy transportation, coal beneficiation, energy exploitation and transformation.
- Civil engineering and steel structures: Structural and civil engineering, bridge-building, joining techniques, offshore techniques.
- Plant engineering: Vessel and equipment construction, pipeline construction.
- Mechanical engineering: driving techniques, crane-building, tools, production techniques.
- Household and packaging: household appliances and equipment, packaging techniques, food techniques, sanitary techniques.
- Environment: equipment for the treatment of waste emissions, water, sludges, noise prevention and the recycling of wastes.

These programmes on products concern, depending on the individual case, action to be taken at research stage (fundamental or applied) or at the pilot or demonstration stage.

The development of new steels and steel products generally require the exploitation of existing knowledge, construction of models and large scale trials under users' conditions.

In fact, the choice of steel grades, processes for using steel and modifications of steel properties are carried out in research which is characterized by complex compromises based on a broad metallurgical knowledge and an understanding of the new fabrication processes (thermo-mechanical treatments, continuous annealing, coating processes).

This research will be concerned with:

- the development of the use of steel products by existing methods and by new techniques in the following domains:
  - forming (high strength steels, coated sheets)
  - weldability,
  - joining and assembly (using adhesives, brazing)
  - machinability,
  - aptitude for thermal treatment (both bulk and surface),
  - aptitude for surface treatment (interface),
  - aptitude for coatings (alloying, painting).

In this field, collaborative R & D at a European level has a vital role to play in standards-making activities such as in the use of steel in construction (Eurocodes 3, 4 and 8), as the single market approaches.

- the development of the user properties of steel, especially:
  - adapting steels having improved properties for specific applications,
  - mechanical properties at high and low temperatures,
  - fracture resistance (ductile and brittle),
  - fatigue resistance,
  - corrosion resistance,
  - behaviour under combined stresses (corrosion fatigue, for example),
  - electrical and magnetic properties,
  - wear resistance,
- as well as the development of classical products, new categories of materials must be considered, notably:
  - composite materials based on steel such as sandwich sheets and other combinations,

- the combination of steel with other materials such as concrete where the products have an improved resistance to fire,
- steels with special structure such as the micro-crystallized steels obtained by rapid cooling.

#### IV. Participation

All enterprises and research institutes wishing to engage in research within the meaning of Article 55 of the ECSC Treaty may make application to the Commission of the European Communities for the grant of financial assistance.

Applications for financial support on the research programme must be submitted to the Commission before 1 September and on the pilot and demonstration projects programme before 1 October of each year to be effective the following year <sup>(1)</sup>.

Application forms and procedure applicable to the lodging and consideration of applications and obligations of the beneficiary as regards protection and dissemination of research results are available at the following address:

Commission of the European Communities,  
Directorate-General for Science,  
Research and Development,  
Directorate for Technological Research,  
ECSC Technical Steel Research Activities,  
Rue de la Loi, 200,  
B-1049 Brussels.  
Telex: 21877 COMEU B.

Under the conditions set out in this communication the Commission may grant financial support for research and for pilot and demonstration projects that relate to the technological and scientific scope in these guidelines and that are of interest to a large number of undertakings in the Community. The projects may be concerned with the production and processing of iron and steel or with the properties, fabrication and utilization of steel.

On the pilot and demonstration projects programme the pilot stage is characterized by the construction, operations and development of an installation or a significant part of an installation having an adequate scale and using suitably large components with a view to verifying the practicability of theoretical or laboratory results and/or increasing the reliability of the technical and

economic data needed to progress to the demonstration stage, and in certain cases to the industrial and/or commercial stage.

The demonstration stage is characterized by the construction and/or operation of an industrial-scale installation or a significant part of an industrial-scale installation which should make it possible to bring together all the technical and economic data, in order to proceed at the least possible risk to the industrial and/or commercial exploitation of the technology.

#### V. Implementation of the programmes

All proposals submitted will be examined on the basis of the following information provided by the applicants:

- a detailed description of the project including, where appropriate, its subdivision into technical phases <sup>(2)</sup>, its organization and its time scale,
- a statement on the current state-of-the-art of research and/or technological development in the field of interest,
- the prospects for the application of the results and the technical and/or economic benefits obtainable for the Community,
- the financial situation and technical capability of the applicant(s) in the project,
- the nature and extent of the technical and economic risks inherent in the project,
- the prospects of economic and/or commercial viability and the means of assessment to be applied,
- the total cost of the project and, where appropriate, its breakdown by technical phases, the financing to include support requested or agreed by the Community, the Member States or by other public or private organizations,
- any other information which justifies the Community support being requested, such as the environmental implications.

<sup>(1)</sup> For 1990 only, these deadlines will be 15 days and 30 days respectively from the date of publication of these guidelines.

<sup>(2)</sup> A technical phase is a stage in the project that is of technical value in itself and provides data enabling the scientific, technical and/or economic justification of the following stage to be assessed and a decision taken on whether or not to continue the project.

For these programmes to contribute effectively to the objectives defined above, the Commission will favour the following actions:

- development of collaborative transfrontier and interdisciplinary projects in order to increase the advantages of collective research and forge a real European spirit,
- promotion of large long-term Community projects, which have high risk, in the areas of strategic interest for the Community steel industry, such as new technology for the production of steel: smelting reduction, continuous casting of thin products, or at the vanguard of progress: coated steel, stainless steels,
- support for coordination with other national and/or Community programmes in order to optimize available resources,
- concentration of the R & D effort on those projects which offer the best prospects for improvement of the technical and economic performance of operations, in the short and medium-term,
- development of the availability of knowledge, thanks to modern techniques of information handling, and also to the interconnection of existing data banks,

Concerning project size, in the research programme, those involving only one organization should not exceed ECU 1 million total project cost for the duration of three years. Preference will be given to large scale transnational projects of major industrial importance for which budgets larger than that mentioned above will be required.

In the pilot and demonstration projects, where collaboration between two or more partners is planned:

- at least one partner must be a steel producer,
- the level of participation of each partner must be more than symbolic and preferably should be at least 10 % of the total budget for the project,
- details of the role and function of each participant must be provided.

Monitoring the progress of contracts concluded on the research and on the pilot and demonstration projects programmes will be undertaken, respectively by a series of executive committees and a series of expert groups. Under the responsibility of the Commission, this will involve six-monthly meetings to examine progress and final reports on contracts, to comment where appropriate on financial aspects and to provide technical guidance on the future development of the projects.

## VI. Evaluation criteria

The main criteria adopted for the evaluation and selection of proposals requesting financial support are as follows:

- the general objectives for steel policy defined periodically by the Commission<sup>(1)</sup> and the objectives of the framework programme for Community research<sup>(2)</sup>;
- the interest of the research and/or technological development for the steel industry (producers and consumers) of the Community,
- the value of the proposal in relation to the scientific and technical aims of these programmes (see section IV),
- the strategic importance of the proposal in connection with the maintenance and improvement of technical cooperation in the Community,
- the advantages (added value) offered by undertaking the research at the Community level compared with the effort at an individual level,
- prospects of industrial and commercial viability in the medium term.

## VII. Advisory Committee

An advisory committee entitled 'Steel Research and Development Committee (Serdec)' will be established to assist the Commission in the overall management of both the research and the pilot and demonstration projects programmes. The organization and tasks of the Committee are outlined below.

### 1. Organization

- The Committee will be composed of a maximum of two members from each Member State appointed by the Commission to serve in a personal capacity. Members will be drawn from senior research and technical management and must have substantial knowledge of the research and development needs of the steel sector. At meetings, each delegation may be accompanied by one technical expert of its choice depending on the nature of the issues under consideration.

<sup>(1)</sup> COM(90) 201 final, Brussels, 7. 5. 1990.

<sup>(2)</sup> OJ No L 117, 8. 5. 1990.

- The chairman and secretariat of the Committee will be provided by the Commission.
- If needed, the Committee may establish *ad hoc* working groups for a specific period of time to carry out a clearly defined task. These working groups shall report to the Committee.
- The Commission shall reimburse the expenses of the two Members from each Member State and, in cases where it is deemed necessary, of one additional expert or adviser.

## 2. Tasks

The Committee will have the following principal functions:

- advise and provide recommendations to the Commission on the priority to be given to proposals submitted annually requesting ECSC financial support on the two programmes based upon their potential economic and industrial significance as well as their scientific and technical merit,
- monitor and issue opinions on the overall development of both programmes, provide advice when required on the work being undertaken on specific projects,
- follow the progress of work of executive committees and expert groups connected with the research and the pilot and demonstration projects programmes,
- the Committee shall help to ensure consistency and avoid duplication with other Community research and development programmes and related activities implemented nationally.