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M E M O R A N D U M

ESTABLISHMENT OF A FOURTH ECSC RESEARCH PROGRAMME

ON THE

"TECHNICAL CONTROL OF NUISANCES AND POLLUTION AT THE PLACE OF WORK AND IN THE ENVIRONMENT OF IRON AND STEEL WORKS"

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I. Introduction - Review of previous programmes

The third research programme on the technical control of pollution in the iron and steel industry, approved by the Commission of the European Communities on 11 February 1974 pursuant to Article 55 of the ECSC Treaty, expired at the end of 1978, after running for a period of 5 years. The 10 million units of account made available for the programme as aid for research projects and for the dissemination of research results relating to the improvement of working and environmental conditions in and around iron and steel works have now been used up.

Most of the aid allocated was to promote work carried out by undertakings and institutions directly connected with the iron and steel industry, although certain more basic research projects were financed for universities and other specialist institutions. This approach made it possible to achieve immediate practical application of the research and a direct improvement in environmental and working conditions.

As had been planned, the third programme covered a wider range of subjects than the previous programmes.

The first research projects in this area, some of which were started in 1958, were aimed primarily at improving working conditions and developing ways of measuring pollutants.

As a result of the rapid increase in the use of oxygen in the iron and steel industry, major research projects were undertaken to combat the emission of brown fume from converters.

The second research programme (1967-1973) dealt mainly with air pollution, but in the closing stages of the programme it was found necessary to promote research on the treatment of waste and liquid effluent.

In the third programme (1974-1978) increased financial assistance made it possible to examine a wider range of problems which have emerged as the iron and steel industry has developed. A great deal of work has been carried out on the treatment of waste and by-products of the iron and steel industry. In particular, efforts have been made to eliminate zinc and lead from the dust emitted during pig-iron and steel production, to upgrade melting shop slag, to store slag and other waste and to separate oil after use.

As far as liquid effluent is concerned, efforts were directed mainly towards the treatment of effluent from coking plants. Various methods were proposed, some of which appear likely to be applied successfully for eliminating wastes, ammoniac, phenol and cyanide. The aim is still to devise reliable techniques which provide adequate cleaning at more favourable investment and operating costs.

The problems are often interrelated. Dedusting operations in large production units result in increasing amounts of dusts and slurries due to filtering and washing processes. Increasing amounts of sludge are also being generated by waste treatment plants. As dumping sites are at the same time becoming scarcer, there is a growing need for more intensive work on examining the possibility of reprocessing such materials. The primary aim is to convert the waste into saleable products which have as high a value as possible. This reduces pressure both on dumping facilities and on the supply of raw materials and energy. Research projects have been successfully conducted in this field and have led to practical pilot programmes and industrial-scale tests.

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The conferences held in 1974 (the quality of the environment in the iron and steel industry), 1977 (coking plants) and 1978 (treatment of iron and steel industry waste) are an indication of the wide interest which the industry pays to these fields.

Researchers continued to devote attention to suspended particles and to certain gases emitted in iron and steel production processes, and work on the origin of brown fume and on fluorine and NO_x emissions was undertaken or completed. It was also found necessary to improve and perfect methods of measuring pollutants in very specific areas. The work of comparing the methods of measuring dusts deposited around industrial sites and of selecting the most suitable equipment for measuring solid, gas and liquid pollutants in the iron and steel industry may be mentioned by way of example.

While the methods of collecting brown fume from converters and fumes from furnaces were greatly improved during the previous programmes and have produced satisfactory results, the control of secondary pollution, i.e. that caused by operations such as charging or casting, requires further study. Installations and capacities should be made proportionate to the purpose of the installations. The first research projects, in particular those concerning the tapping of the blast furnace and melting furnaces, are an indication of how this work may be orientated in future.

Emissions from coking plants (dusts and gases) continued to occupy the attention of researchers, and plans to collect all emissions by means of a hood covering the coke ovens were studied using a model. At the end of the financial year a research project on the sealing of furnace doors was accepted.

Because of the increasing power of electric arc furnaces, the industrial world has become keenly aware of the urgent problem of the noise pollution caused by these furnaces.

A Community research project aimed at coordinating work in this area was embarked upon in several of the Community countries concerned. It is intended to test methods of avoiding or confining furnace noise or of reducing the cyclic nature of the electricity supply. These projects were preceded by ergonomic work carried out as part of a different Commission programme.

II. The need for research into pollution control in the iron and steel industry.

Despite the visible successes and improvements achieved hitherto, the problems identified and tackled in the third programme cannot be regarded as having been finally solved. The reasons are as follows:

- satisfactory solutions have still to be found for certain problems;
- new problems have emerged as a result of technological change or of new information on the effects of certain substances or emissions on man and the environment;
- gas and effluent cleaning in turn leads to problems of satisfactory disposal of the residual waste products;
- at present noise abatement is often still limited to costly screening arrangements of varying effectiveness for lack of the basic knowledge required for a more radical approach (reduction of noise must be taken into account at the design stage) ;
- the situation as regards investment and operating costs needs to be improved;
- energy consumption for pollution control should be reduced without loss of efficiency.

Greater priority is given in present-day research than in previous years to ensuring, at the design stage, that problems of environmental and working conditions do not arise. Industrial processes and working techniques are arranged so as to keep pollution to a minimum. Where this is not possible because of the nature of the processes employed or for other reasons, every effort is made to

minimize such problems and to keep them within reasonable limits. The improvement in the quality of life thus achieved must go hand in hand with conservation of natural raw materials and energy resources, and the costs involved must be tolerable. The efforts made to safeguard and improve the environment, and hence working conditions, presuppose continuing scientific and technological progress. Continuation of the third programme in the light of the latest knowledge and requirements would be essential in helping the iron and steel industry to achieve its aims in connection with environmental and working conditions.

In the process of harmonizing laws, directives, regulations etc. there is an increasing need for standardized methods of sampling, measurement and analysis of measurement data. Measurement data are constantly being compared internationally; but in the vast majority of cases it is not realised that the results obtained by different measurement techniques are generally still not directly comparable.

The above considerations indicate that research into the further development of pollution control equipment should henceforth be based on the following objectives :

a) improving environmental and working condtions ;

b) complying with official requirements ;

c) maintaining the competitiveness of the works and thus safeguarding employment ;

d) conserving raw materials and energy.

Emphasis will therefore be placed both on long-standing problems for which satisfactory solutions have not yet been found and on the new problems which are constantly arising as a result of technological progress.

As in the previous programmes, it is hoped that research on industrial hygiene and pollution control will keep abreast in technology. Allowance will be made for industrial and environmental hygiene when production tehcniques are devised.

A research programme extending over several years cannot hope to keep pace with developments in a major industry such as the modern iron and steel industry, which is going through a period of economic and technical change.

The fields covered by this programme will be dealt with along similar lines to technical research on steel and, in the case of coking plants, to technical research on coal. Several projects have already been jointly financed by the technical and social sectors, and it would be very worthwhile to extend this cooperation. Account has also been taken of the general objectives which the iron and steel industry sets periodically in accordance with the ECSC Treaty.

Close contact will be maintained with the Environment and Consumer Protection Service, which is responsible for the Communities' environment policy. In particular, account will be taken of existing or future directives which establish Community legislation in this area. As the programme is subject to constraints as regards financing, administrative capacity and time-span, certain priorities, which are already clearly determined, have to be adopted, whether they are the result of action already started and which should be continued, or whether they have emerged as a result of a technical development or legal requirement.

The following may be regarded as the programme's main priorities:

- Continuation of research on effective and economic measures to reduce dust and gas emissions in shops and in the vicinity of works.
- Research and development work on techniques of cleaning effluent, with particular reference to effluent from coking plant.
- Treatment of iron and steel industry waste. Waste will be regarded as a by-product of pig iron and steel production. This sector includes the upgrading, recycling and storage of waste products.
- Research aimed at reducing the noise level and vibrations of furnaces and other plant and machinery used in the iron and steel industry. Account will be taken of the knowledge which has accumulated over a long period as a result of medical and ergonomic programmes. Special efforts will be made to devise suitable preventive techniques.
- Special research into hygiene at work. Removal, by appropriate means, of poisonous gases or other substances.

III. Research programme

The order in which the fields covered by the programme are presented corresponds to the sequence in which steel is conventionally produced and rolled. The main areas of research discussed above will therefore be dealt with in the following sections.

1. Coking plants

While substantial progress has been made in reducing emissions in new plants, especially during the oven charging and quenching operations, further developments are necessary, and means of improving existing plants must be devised. Particular importance still attaches to the prevention of emissions as a result of leakage and during coke pushing.

The need to pay special attention to the treatment of coking plant effluent is as great as ever.

2. Sintering of iron ore

Despite the considerable achievements in dust collection in sintering plants and associated installations, the use of residues and variations in fuels and ores pose as yet unsolved problems with regard to the effect of these materials on the quantity and composition of the dust and noxious gases emitted. In this context mention should also be made of the cooling of the sinter. Ore pelletization processes also involve some problems of air and water pollution which have not yet been satisfactorily overcome.

3. Blast furnaces

While the blast furnace process itself may be regarded as non-polluting, satisfactory solutions have still to be found for a number of major problems of a secondary nature. These include the reduction of secondary dust emissions during tapping, the abatement of noise due to change-over of cowpers, burdening of blast furnace and blowing-off, and improvements in the handling of water, dust, slurries and slag.

4. Melting shops

The remarks on pig iron production also apply here. With certain exceptions, primary dedusting may be regarded as satisfactory, although research may still be carried out to devise techniques which are less costly and cumbersome. Special attention needs to be paid to operations such as the desulphurization of pig iron and the charging and tapping of melting furnaces or converters. It is also essential to carry out further work on noise abatement in electric furnaces. Melting shop slag also needs to be studied with a view to increasing the proportion of waste which can be re-used and to reducing the quantities dumped.

5. Rolling mills

In addition to the familiar sources of pollution mentioned in the third programme and requiring special measures to prevent air and water pollution, i.e. those associated with re-heating furnaces, flame scarfing, grinding and pickling, research should also cover certain secondary sources, such as oil mists at certain types of rolling stand.

Hot-rolling mills account for a considerable proportion of steelworks effluent. The techniques for treating this effluent must be further developed and fundamental principles must be established for the design of water treatment plants. No satisfactory solution has yet been found for the treatment of oily sludges from rolling mills or oily mill scale, and further research is required in this area.

6. Measurement

Measurement of pollution played a major part in the last three programmes. The fourth programme seems likely to focus on the following points :

- development of measurement techniques, especially for continuous measurement ;
- adaptation of existing techniques to the particular needs of the iron and steel industry;
- Harmonization of sampling, measurement and analysis procedures to ensure comparability of results.

7. General problems and areas of overlap

- Reduction of emissions of fine dust and gaseous pollutants such as F, NO_x, SO_2 and malodorous substances such as H_2S, Mercaptans, etc.;
- reduction of pollution caused by the storage and handling of waste products in the form of dusts and slurries ;
- treatment, processing and recycling of waste from iron and steel production and from air and water cleaning plant ;

- development of suitable dumping techniques for the disposal of waste resulting from the production of pig iron and steel ;
- detection and assessment of the effects of pig iron and steel production on the environment ;
- measures to reduce the volume and degree of contamination of effluent ;
- reduction of energy requirements and costs of gas cleaning, effluent treatment and recycling ;
- precautions against the hazards of inhaling toxic gases and dusts, e.g. silicosis-producing dusts emitted when handling certain refractories or abrasives ;
- reduction of the noise produced by certain plant in the iron and steel industry and development of suitable low-cost means of noise abatement to protect both employees and the environment ;
- reduction of the noise produced by transport equipment used in the iron and steel industry, to protect employees from excessive noise and vibrations and to prevent noise in populated areas ;
- replacement of cleaning agents and adjuvants, which can cause damage to health or to the environment.

IV. Coordination of work

The previous programmes were organized satisfactorily once they had been accepted by the Commission. The Commission is advised on the promotion of projects by three consultative committees - the Research Committee, the Committee of producers and workers on industrial safety and medicine and the Committee of government experts, whose members are suitably qualified.

When the Commission accepts a project it concludes a contract with the party concerned which makes it compulsory to submit technical reports on the work carried out. These are examined and discussed by experts' working parties which submit reasoned opinions to the Commission.

Where necessary, these working parties meet at research centres or in the works where the research is being conducted, and they are thus able to gain a first-hand impression of the work on which they are called upon to comment.

It is expected that the present programme will also be organized in this way.

The subjects covered by this programme are dealt with, to a greater or lesser degree, depending on their powers or areas of competence, by international organisations such as the ISO, the United Nations and the OECD, etc. It has been found in the past that close relations with these organisations are valuable for organising research projects and that the programmes are furthermore of considerable help to these institutions in their work.

V. Research results

Details of projects and of the results obtained will be passed on to those concerned. Research reports are made available as early as possible to the members of the experts' working parties. These experts are all specialists in the iron and steel industries of their respective countries, and thus the research findings can be passed on quickly to these industries.

To ensure that information on research undertaken reaches as wide a public as possible, details of projects for which financial aid is allocated will be published in Euro-Abstracts, which will also publish final outline reports as they are drawn up. In addition, interested organizations or individuals may obtain a complete final report on request from the Commission. Readers are reminded that information is also available from other sources, e.g. offprints of articles on research projects, conferences etc. The Steel Industry Safety and Health Commission contributes towards safety and health in the industry by organizing exchanges of experience among the Member States.

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This organization may be assisted in its work if the findings of the projects are made known to it.

VI. Financial aspects and duration of the programme

The previous programmes on industrial health and safety and pollution control in the iron and steel industry ran for five years. This has proved sufficient for positive results to be drawn from the projects, and in many cases it has been possible to apply the results under practical conditions with little delay.

The projects have usually lasted two and sometimes three years, as will be the case in the present programme, which it is proposed will run for five years.

The funds to be allocated for the programme include not only the financial aid for the projects but also the related costs of implementing the programme and disseminating the results, as well as the costs of publication, translation, typing, distribution media, etc.

In assessing the funds required, account was taken of the cost of previous projects, average cost increases, the annual budget for social research in the coal and steel sector, and the equipment required by institutions and individuals for the satisfactory organization of the programme. In addition, the transition from the research stage to a more advanced pilot or development phase sometimes involves increased expenditure.

In view of the above and of the fact that Community financial aid does not usually exceed 75% of the direct costs of the projects, the remainder being paid by the recipient, it is felt that to implement a satisfactory programme which makes an effective contribution towards improving industrial hygiene in and around steel works, it is necessary to allocate funds amounting to 15 million EUA, spread over 5 years from 1979.

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VII. Conclusions

The Commission of the European Communities

- considering the need to encourage research on industrial hygiene at the work place in the iron and steel industry and on the improvement of the environment ;

- taking into account the favourable opinions and agreement expressed concerning research by the professional, government and scientific consultative committees ;

- having regard to Article 55 of the Treaty establishing the European Coal and Steel Community ;

proposes to make available 15 million EUA for the implementation of a research programme on the "Technical control of nuisances and pollution at the place of work and in the environment of iron and steel works" for a period of 5 years from 1979.