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PROPOSAL FOR A MULTIANNUAL PROGRAMME OF RESEARCH AND DEVELOPMENT IN THE EUROPEAN COMMUNITIES ON PAPER AND BOARD RECYCLING (1978-1980)

Indirect action

(submitted to the Council by the Commission)

COM(77) 388 final.

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SUMMARY

The present proposal concerns a Community Research and Development programme in the field of paper and board recycling.

This programme is motivated essentially by the need, on the one hand, to solve the problems of raw materials supply of the paper and board industry of the Community , these problems being one of the main causes of the current difficulties facing that industry, and, on the other hand, to improve the management of wastes, as foreseen in the action programme of the European Communities on the environment of 17 May 1977.

Raw materials supply would be facilitated by increasing the recycling of paper and board since a valorization of the main types of old papers would allow a better utilization of several kinds of old paper resulting, consequently, in a more efficient adaptation of raw materials to the final products. An indirect economic advantage would also be gained through an increase of the Gross Internal Product.

In addition, the environment would obviously benefit from the intensification of recycling which, among other advantages, results in a proportional decrease of the waste which has to be disposed.

Technically, it appears that, in order to reutilize additional amounts of old paper and board, it is necessary to upgrade all types of old papers through new and more appropriate technologies and processes.

Four major research topics were selected to this effect and cover most R&D needs in this area :

1st topic : characterization of reclaimed fibres, their upgrading by various processes, and the effects of multiple recycling on paper making fibres ;

2nd topic : elimination of the detrimental effect of contaminants in waste paper including the dispersion of thermo-softening contaminants ;

3rd topic : de-inking, including the relationship between different types of ink and de-inking, and the treatment of effluent from waste-paper recycling plants ;

4th topic : use of urban fibres, including technological characterization of solid urban waste and health problems caused by the use of recycled fibres.

The programme will be implemented as an indirect action by means of cost-sharing contracts with private and public research organizations in the member-states, financed partly by the Community.

The maximum amount contributed by the Community for the whole 3-year programme (1978-1980) is estimated at 2.900.000 EUA.

The programme will be managed by the Commission departments in liaison with an Advisory Committee on Programme Management for paper and board recycling R&D, established for this purpose by the Council. Close cooperation will also be ensured with the Committee on Waste Management established by the Commission in the framework of the action programme of the European Communities on the environment.

PROPOSAL FOR A MULTIANNUAL PROGRAMME OF RESEARCH AND DEVELOPMENT IN THE EUROPEAN COMMUNITIES ON PAPER AND BOARD RECYCLING

(Indirect action : 1978-1980)

1. INTRODUCTION

1.1. The problem of raw materials supply, for which the Community depends to a large extent on the rest of the world, has given rise during the recent years to serious preoccupations with regard both to trade balances and security of procurements.

The Scientific and Technical Research Committee (CREST) has deemed necessary to establish in 1974 a Sub-Committee on raw materials R&D entrusted with the task of assessing to what extent Community R&D actions could contribute to alleviate supply problems and to determining the possible contents of such actions.

In a first report dated November 1975, the Sub-Committee recommended to set up a working party on paper recycling in order to analyse the situation in the member states and to define research actions which could help raise the rate of recycling of paper and board and to improve the quality of recycled papers.

The working party,on the basis of the contributions and the experience of the experts from the member states, has suggested a number of research topics and projects which were used in preparing the present programme proposal.

It must also be mentioned that the action programme of the European Communities on the environment for 1977-1981, approved by the Council on 17 May 1977, foresees an overall policy for recovery, recycling and re-use in a campaign against wastage and in waste management. One of the priority actions is concerned with the recovery and re-use of old papers. To this end, a working party on old papers was set up in July 1976, which operates under the terms of reference of the Advisory Committee on Waste Management.

Besides, the CREST Sub-Committee, having been informed that the Commission is undertaking parallel research activities in the pulp and paper sector, especially under the Energy and Environment programmes, also expressed the wish that all specific initiatives taken by the Commission be coordinated, for the following reasons :

- coherence of priority criteria
- horizontal character of R & D initiatives
- optimal impact ensured for Community activity
- speedy circulation of data

Such coordination of Community R & D activities in the pulp and paper sector should be obtained by organizing meetings of national experts and programme officers, under the auspices of CREST or of the CREST Sub-Committee for Raw Materials.

1.2. Reasons for the promotion of paper and board recycling

The need to increase sources of raw materials for paper-making, in particular by the recycling of paper and board in the Community, has been investigated as a result of the Community paper industry's growing awareness of powerful competition from the Scandinavian and North American paper industry. The communication from the Commission on the problems posed by the paper industry in the Community (document SEC (74) 1215 f inal) has been forwarded to the Council. It sets out the

various possibilities for Community action to safeguard the development of the paper industry in the Community.

After examination of this communication, the Permanent Representatives Committee invited the Commission to continue its work in this sector and, if appropriate, to draft whatever practical proposals it felt should be submitted on action in support of the paper industry.

Investigation of the problems posed by the paper industry in the EC clearly revealed :

(a) that the Community market is dangerously dependent on the outside world : net imports of paper materials from outside the Community have represented more than 50 % of Community paper and board consumption in the last 10 years;

(b) that the enlarged Community's balance of trade in paper raw materials and products with the non-member countries is heavily in deficit, and this deficit has increased substantially in recent years despite the world recession. In 1972 it stood at almost 2.000 million u.a. while in 1975 it exceeded 3.000 million u.a.

(c) that forestry and other vegetable sources in the Community cover only about one-sixth of requirements and an increase in these resources can only be envisaged to a limited extent (doubling of current production) after a fairly long period (at least 20 years) following the implementation of an adequate and vigorous forestry policy;

(d) that wastepaper has covered about 40 % of the Community paper and board industry's requirement of fibrous materials in recent years but in some member countries this proportion represents only about 30 % of Community paper and board consumption.

The desirability of proposing more intensive recycling of paper and board is apparent in all the Member States :

- for a very long time, the paper industry has found recycling an effective way of offsetting the problems experienced in obtaining supplies of pulp wood and fresh pulp, and of withstanding competition from Scandinavian and North American producers;

- more recently, the public authorities have regarded increased recycling as a way of economically eliminating waste paper from urban refuse and of substantially reducing imports by the paper industry and the dependence of this industry on the outside world.

2. JUSTIFICATION FOR A COMMUNITY RESEARCH AND DEVELOPMENT PROGRAMME ON PAPER AND BOARD RECYCLING

2.1. General

The benefit to be gained from this research programme can be assessed from two points of view : the supply situation and environmental protection.

2.1.1. Raw materials

An improvement in recycling techniques would make it possible to use waste paper in areas where it is little used at present (paper for printing, paper for domestic and sanitary uses), whilst at the same time providing access to new sources of raw materials. The result would be a drop in consumption of mechanical and chemical pulp (frequently imported from non-member countries).

For purposes of comparison, the rate of use of waste paper in printing papers is currently very much lower than its rate of use in other types (paperboard, corrugated paper and other types of wrapping paper). The rate of use (quantity of waste paper used/quantity of paper produced) recorded in 1972 was 6,5 % (EC average) for printing papers as opposed to a rate of 40 % for all paper and board.
Nowadays the recovered pulp used in printing papers has to be a substitute from the following resources :

- direct incorporation of wood-free noble qualities of the white trimmings or punch card type, substituted for chemical pulp;
- incorporation of old de-inked newspapers in the manufacture of newprint to replace mechanical pulp (Federal Republic of Germany and United Kingdom).

In both cases the resource is limited and any increase in demand upsets the prices for these types of waste paper and is thus likely to discourage their use.

More detailed research on recycling will make it possible to make use of further types of waste paper :

- waste containing wood paper (particularly magazines with a high percentage of wood) in order to obtain a pulp similar to mechanical pulp;
- waste wood-free paper (particularly leaflets) in order to obtain pulp of a type somewhere between mechanical pulp and chemical pulp from hardwood fibres.

Characterization of reclaimed fibres combined with better elimination of contraries, an improvement in de-inking techniques and more intensive and profitable recovery of urban fibres will make it possible to make be better use of certain types of waste paper. This will allow a more sensible allocation of paper-making raw materials in accordance with the products manufactured.

For one thing, certain qualities of waste paper currently used as filler can then be reserved for better purposes. For example, old newspapers and leaflets now used in paperboard could, after efficient de-inking, be used for the production of printing paper. However, this is only conceivable if board manufacturers can be offered a substitute raw material such as urban fibres.

Secondly, it might be possible to substitute de-inked pulp made from waste containing wood paper in those processes where mechanical pulp is traditionally used. This is important at a time when improved mechanical pulps (thermomechanical pulps) are finding uses in the production of higher quality paper than formerly.

Research on de-inking is required because present techniques are not capable of adequately de-inking a good many papers printed by the offset and photogravure processes. The appearance of new types of inks (particularly UV inks,and inks for offset news-papers) makes further research on de-inking all the more necessary.

Research is also necessary to reduce pollution from de-inking.

This research should be done jointly with ink manufacturers and printers.

2.1.2. Environment

The recycling of waste paper obviously offers environmental advantages;

(a) the quantity of paper recycled reduces waste from economic activities (business, administration, household, etc,...) by an equivalent volume;

(b) each tonne of recycled waste paper saves the equivalent of two to three cubic metres of wood (or about 15 medium-sized trees);

(c) papermaking from waste paper causes less water pollution than the equivalent production of paper from wood.

It is well known, however, that some recycling operations especially de-inking, cause a degree of pollution. This calls for the following comments :

(i) The pollution resulting from the de-inking of waste paper bears no comparison with pollution resulting from the manufacture of chemical pulp.

Since the use of de-inked pulp (particularly de-inked pulp produced from waste paper containing no wood) in some instances makes it possible to reduce the volume of chemical pulp used, on balance de-inking is an advantage for the environment. A new de-inking unit will cause less pollution than a new chemical pulp factory.

(ii) De-inking still causes more pollution than the manufacture of mechanical pulp or any conventional method of treating waste paper. But many improvements could be made.

It should not be forgotten that, to begin with, de-inking, particularly de-inking by washing, was regarded as a highly polluting process. Today, the residual pollution from flotation de-inking is acceptable and the process has already undergone many improvements. For instance, a great step forward was taken with loop circuits - water consumption is now approximately 15 - 20 m3/t of pulp compared with 100 m3/t of a few years ago.

With further research it would be possible to reduce pollution even further. For one thing a compromise must be found between the effectiveness of the de-inking process (yield) and pollution. For another, it would be possible to combine various processes.

(iii) It appears that considerable improvement is possible in the treatment of the effluent and the elimination of wastes from the de-inking process:

- where effluents are concerned, more detailed knowledge of the effects of the ingredients of the inks, the behaviour of the additives used in the various processes and the phenomena of toxicity would make it possible to perfect effective treatment techniques;

- where wastes are concerned, elimination techniques suited to the particular nature of the de-inking sludge still have to be perfected. This is a big problem since, if a process has a yield of 80 %, there is a 20 % loss of material.

Assuming a drying factor of 30 % for the sludge, every 800 Kg of de-inked pulp produced would mean 660 Kg of sludge. Also, the composition of the sludge varies as the undertaking doing the de-inking can rarely dictate the nature of its raw material, namely waste paper.

2.2. Technical

2.2.1. So far, measures by the public authorities have mainly been aimed at improving conditions on the waste paper market (where virtually chaotic fluctuations in prices and volume of trade jeopardize any efforts to promote recycling) and stepping up the collection of waste paper. However, it seems that the increased quantities of waste paper collected cannot be entirely absorbed by the paper industry without applying and developing processes and machinery for the production of paper from recycled fibres. The additional quantities of waste paper collected are in fact of poorer quality than the quantities of waste paper collected and absorbed so far by the industry; in order to absorb the additional quantities of waste paper it is necessary to upgrade all waste paper qualities by means of new and more suitable technologies and processes so that :

- superior grades of waste paper can be used to produce superior qualities of new paper (writing and printing qualities)

- the inferior qualities of waste paper can be used to produce lower

qualities of paper and board, which are at present absorbing the superior grades of waste paper.

2.2.7. Current research and development in the Member States is mainly sponsored by paper and board producers, equipment suppliers and the chemical industry.

Most of the work is concerned with the development of machinery, products and processes rather than with research aimed at an overall conservation of raw materials. Furthermore, details of these activities remain confidential. The main research topics are therefore dealt with piecemeal by a number of laboratories, without consultation or coordination.

Consequently, a programme of research and development covering, at Community level, matters of common interest and essential relevance to more intensive recycling is necessary.

2.3. Economic

Quite apart from the current crisis situation, a regular increase in paper and board consumption in the Community and in the industrialized world is to be expected in the years ahead. This will be accompanied by a growing shortage of fibrous raw materials from which the paper industry will be the first to suffer. It will also result in a parallel increase in the volume of waste from industry, commerce, public departments and local authorities. These two harmful effects can be offset only by increased use of waste paper in different types of paper and board.

The situation in the Community was as follows in 1975 ;

paper and board consumption	24.7 million tonnes
paper and board production	18.8 million tonnes
quantity of waste paper used	7.9 million tonnes

giving :

- recovery rate (ratio between the quantities of waste paper reclaimed and apparent paper and board consumption) 32 %

- rate of use (ratio between quantities of waste paper used and paper and board production) 42 %

Increased use of waste paper is possible but depends mainly on the technical possibilities of recycling. A comprehensive and detailed study of paper and board recycling in the European Community carried out in 1974 has shown how useful the results of a research programme to upgrade reclaimed fibres would be. The programme proposed below is in line with this aim. The practical results expected would lead to an increase in the rate of use that could be as high as 58 % between 1980 and 1985.

On the basis of the quantities of paper materials produced and used in 1975, an increase of this nature in the rate of use of waste paper would be equivalent to a saving in pulp consumption of about 3 million tonnes per annum or an equivalent increase in Community paper and board production.

One consequence could be a corresponding drop in pulp and/or paper and board imports, which would reduce the Community deficit in the balance of payments for paper materials as such (based on 1975 prices and quantities) of about 750 million UA per annum, taking the average price of the pulp saved as 250 UA per tonne.

A further consequence would be a reduction in the cost of waste disposal proportionate to the extra quantities of waste paper recycled. Estimates in the United Kingdom indicate that waste paper represents in that country 60 % of the total volume of household refuse.

A further benefit is the saving resulting from the fact that less energy is required to produce recycled paper than paper from fresh fibres : the energy used to produce wood pulp (not including drying) is about 1.000 kWh/t while it is only 250 kWh/t for pulp from recycled fibres.

3. COMMUNITY RESEARCH AND DEVELOPMENT PROGRAMME FOR PAPER AND BOARD RECYCLING

3.1. On the basis of a survey of R & D in hand or planned on paper recycling and an assessment of current research needs in this sector, carried out with the working party of CREST, the Commission has deemed necessary to propose a series of R & D actions to be carried out at Community level, aimed at filling the most important gaps while avoiding useless duplication.

Four major research topics were selected to this effect and cover most R & D needs in this area.;

1st topic : characterization of reclaimed fibres, their upgrading grading by various processes, and the effects of multiple recycling on paper making fibres;

2nd topic : elimination of the detrimental effect of contaminants in waste paper, including the dispersion of thermo-softening contaminants.

3rd topic : de-inking, including the relationship between different types of ink and de-inking, and the treatment of effluent from waste-paper recycling plants;

4th topic : use of urban fibres, including technological characterization of fibres in solid waste and health problems caused by the use of recycled fibres.

3.2. Each of these four topics has been studied in detail and the following have been defined :

- framework of research to be undertaken on the topic concerned;
- general, technical and economic reasons for the research, together with the benefits expected from application of the results;
- time required for the research in question, having regard to existing resources (facilities, manpower) and short-term availability of competent research centres;
- estimate of the total cost of implementing the research programme.

This information is given for each of the four topics on pages 15 to 31 of this document.

4. PROCEDURES FOR IMPLEMENTING THE RESEARCH PROGRAMME

4.1. The programme will be implemented as an indirect action by means of contracts, partly financed from the Community budget, concluded with public or private research organizations in the Member States.

4.2. Duration

The R & D programme is proposed for a period of three years (1978-80). Gradual adjustment to possible new research requirements will be made during the course of the programme.

4.3. Ways and means

Funding the programme implies a maximum financial contribution of 2,9 M.U.A. from the EC budget for a three-year period. These funds are to be used for partial financing (50 % as a rule) of research projects pertaining to the four research topics, as well as to cover the costs of management and coordination of the programme, as follows:

Topic	Total cost MUA/3 years	Maximum EC contribution MUA/3 years
1. Characterization of recycled fibres	1.20	0.66
2. Elimination of contaminants	1.20	0.66
3. De-inking	1.60	0.87
4. Urban fibres	1.30	0.71
	Total	2.90
	of which 0,325 for management and coordination	

5. PROGRAMME MANAGEMENT

The research programme will be managed by the Commission departments assisted by an Advisory Committee on Programme Management for Paper Recycling Research to be established with the terms of reference stated on pages 36 and 37. Its main task will be to advise the Commission departments in :

- examining and selecting the projects to be included in the programm from the proposals submitted by research organizations in the member states;
- keeping track of progress and reporting to the various bodies concerned; including the Committee on Waste Management.
- contributing to coordinate national and Community research activities on paper recycling by organizing contact meetings between the experts concerned.

The Committee on Waste Management established by the Commission on 26 April 1977 will be consulted particularly with regard to :

- relative priorities of research needs and changes thereof in relation with the implementation of the action programme in waste management and resulting adaptation of the research programme;
- the application of research results obtained from the programme.

6. DISSEMINATION OF INFORMATION

The information resulting from the implementation of this programme shall be disseminated in accordance with Regulation (EEC) N° 2380/74 decided by the Council on 17 September 1974.

DETAILED DESCRIPTION OF RESEARCH TOPICS

RESEARCH TOPIC Nº 1

1. Title

The characterization of recycled fibres, their upgrading by various processes and the effects of multiple recycling on papermaking fibres.

2. State of the art.

Several laboratories have conducted multiple recycling experiments but the reported results are mainly technological and relate principally to properties of the sheets or products made from or containing a proportion of the recycled fibres.

Until recently, processes such as de-inking and the removal of contaminants have been commonly described as "upgrading" in so far as they facilitate the use of recycled fibres processed in these ways which are, in many instances, inferior to the virgin fibres, sheets made from recycled fibres show poorer mechanical properties such as tensile strength, burst and compressive strength.

Research established methods for evaluating the repulpability of waste paper and quality of the resultant papermaking stock in terms of its fibre dispersion, cleanliness, colour etc...

This research and some comparative studies of mill stock preparation and cleaning system performances have shown that whilst they can achieve similar results in these terms (i.e.fibre dispersion, cleanliness and colour), their effects on the fibre properties and hence the sheet mechanical properties are substantially different.

It is therefore concluded that, in future research and development both these aspects should be considered to ensure that as far as possible existing and new processes for preparing waste paper stocks should also "upgrade" (or at least not worsen) the properties of the recycled fibres and the properties of the sheets from which they are made.

Other work now in progress is indicating the character of the fibre degradation caused by recycling. It is also identifying the mechanisms and processes by which this fibre degradation may be reduced or repaired so that the properties of sheets and products containing recycled fibres can be substantially improved.

3. Status of research in the Member States

(based on information supplied to the Commission)

Belgium

The "Faculté des Sciences Agronomiques de l'Etat" (Gembloux, Belgium) commenced a study in october 1976, to terminate in 1978, to characterize recycled fibres, examine possible chemical upgrading techniques and apply them in the laboratory.

A Belgian company has also submitted a proposal to IRSIA (Institut pour l'Encouragement de la Recherche Scientifique dans l'Industrie et l'Agriculture) to study upgrading techniques of cellulose fibres, particularly recycled fibres.

Federal Republic of Germany

The IfP (Institut für Papierfabrikation) in Darmstadt has undertaken numerous research projects on the use and recycling of waste paper, including :

- R & D on the preparation of waste paper as a raw material (disintegration, filtering, fractionation, beating);
- basic research on the physical properties of waste paper in suspension and paper made from waste paper. IfP is continuing its work in this field, in particular on :
  - characterization of the influence of multiple recycling on the properties of fibres in suspension and papers made from waste paper; determination of correlations between the properties of the suspension and of the paper;
  - improvement of the properties of the product obtained by recycling for the production of testliner and corrugated cardboard by mechanical (refining) and chemical (additive) methods;
  - technological classification of waste paper grades in relation to the classification of the virgin pulps they are to replace : classification based on tension, optical properties, other physical and chemical properties, toxic impurities such as Pb, Hg and Cd..

Industry is engaged on product research and development to improve the qualities of papers made from waste paper or increase the quantity of waste paper that can be substituted for fresh pulp.

United Kingdom

For some years past PIRA (Paper Industry Research Association) has conducted research into the use and development of pulp and papermaking stock characterization methods,

and, also, into the measurement of sheet and product properties. This work has recently resulted in the development of some novel apparatus and techniques for measuring fibre properties and relating these properties to the sheet forming process and the sheet properties.

In 1974 research was commenced at PIRA to identify the mechanisms and prevent or reserve the effects of fibre degradation caused by recycling. Currently, laboratory experiments and some pilot machine trials have been made on processes to prevent and repair this fibre degradation.

Part of these PIRA research programmes is being conducted in collaboration with the Department of Paper Science at the University of Manchester Institute of Science and Technology (U.M.I.S.T.).

4. Expected results.

If this programme is undertaken it is intended and expected that the results and reports will :

(a) Define in physical and chemical terms the essential and industrially relevant differences between virgin and recycled fibres

(b) Thereby (from a)above) indicate both the need for and practical means whereby the adverse effects of recycling can be prevented or repaired.

(c) Provide practical guidance to paper and board makers on the use and development of equipment and processes for increasing and extending the range of utilization of fibres derived from wastepaper.

5. Detailed description

5.1. Continue and extend the inter-related measurements on fibre and sheet properties to identify and quantify the fibre degradation caused by recycling, with due regard to :

(a) The different regimes of recycling (i.e. collection, segregation, storage, stock preparation, sheet making/drying/finishing).

(b) The different types of virgin pulps in use and types of fibres derived from waste papers which are available and whose supplies could be increased (e.g. "lower grades" and "urban fibres").

(c) Concurrent Research and Development - especially other projects adopted as part of this Paper Recycling Research & Development Programme - on the separation of contaminants and de-inking of waste paper.

5.2. Concurrently and on the basis of 5.1 above, select and test in the laboratory various upgrading techniques which will prevent or repair the fibre degradation (and concomitant effects on sheet properties) caused by recycling.

(a) Chemical treatments)
(b) Thermal treatments) and advantageous combinations
(c) Mechanical treatments)

5.3. Concurrently and from 5.2 above, select and test on pilot or machine scale, techniques of potential industrial utility which will facilitate the economic manufacture of satisfactory paper and board products containing recycled fibres with due regard to :

(a) Actual and potential availabilities of waste papers.

(b) Any changes of an environmental nature which might attend adoption of the technique (e.g. sludge disposal, water pollution).

(c) The utilization of existing paper and board mill capital equipment and any additional investment which adoption of the technique might require.

5.4. Prepare and issue periodic reports on this work to promote "industrial feedback" to the Research & Development programme and maximize the rate of industrial implementation of the knowledge discovered.

6. Duration

It is envisaged in the initial stage that this project would run for a period of 3 years, subject to periodic (preferably annual) reviews.

7. Estimated total cost

The total cost of the project is estimated at 1.200.000 U.A.

RESEARCH TOPIC.Nº 2

1. Title

Elimination of the detrimental effect of contaminants in waste paper, including the dispersion of thermosoftening contaminants.

2. State of the art.

Various studies have been published on either the contaminants themselves or waste paper stock preparation lines, including the processing cost aspect.

Manufacturers and several research establishments in the Member States have conducted research to improve waste paper stock preparation equipment and reduce waste paper processing costs.
At present, for both mixed and clean waste paper, nearly all stock preparation lines are similar : one pulper, two deflaking stages, four cleaning stages and sometimes a contaminant dispersing stage. However, for both categories the technological and technical research of the various installations differ widely.

There are various types of equipment for the dispersion of thermosoftening contaminants but they all have disadvantages : high purchase and operating costs and deterioration of the mechanical properties of the fibres.

3. Status of research in the Member States
(based on information supplied to the Commission)

In France, research on decontamination of recycled paper is in progress at the Centre Technique du Papier (CTP) in Grenoble, supported by private industry (machinery manufacturers and paper mills) and by the State.
This research relates mainly to :

(a) A study of the "contaminants" resulting from the presence of hot melts and adhesives

(b) study of modern waste paper processing equipment and evaluation its efficiency

(c) development of new decontamination processes for general or specific application (paper/plastics complex etc.)

(d) collaboration with raw materials manufacturers (repulpable adhesives, etc.).

In the Netherlands collective research based mainly on industrial research is being undertaken by the Vezelinstituut TNO; it relates to technological and economic evaluation of stock preparation systems including dispersion of contaminants.

In the United Kingdom several research projects have been undertaken at PIRA on waste paper contaminants and tests on the conversion of waste paper into pulp. This research is described in a confidential report circulated only to the members of PIRA and British governments departments.

4. Expected results

This research programme is expected to lead to the design and implementation of plans to convert modern waste paper preparation lines into specialized lines better suited to the processing of the various types of waste paper.

The use of specialized stock preparation lines suited to the different types of waste paper will greatly improve the quality of the pulp produced from these types (ranging from urban fibres to white trimmings and offcuts).

It may also be estimated that these applications will bring about a substancial reduction in waste paper processing and recycling costs by cutting back capital costs and machine maintenance costs and greatly diminishing energy and water consumptions.

5. Detailed description

5.1. The first phase will consist of collecting at Community level basic data on contaminants causing productions disturbances and product defects, characteristics of waste paper containing these contaminants, modern equipment and processes to handle contamined waste paper, advantages and defects of this equipment for evaluation of its efficiency.

5.2. In the second phase, the technological and economic characteristics of modern processes and equipment used in the paper industry will be assessed. Tests on the removal and dispersion of contaminants (by chemical and mechanical methods) will be carried out in specialized laboratories and on pilot plant belonging to paper research centres, paper machinery manufacturers and papermills in the Community.

5.3. In the third phase, a number of stock preparation lines in paper mills for both mixed waste paper and clean waste paper will be compared. The differences in pulping, deflaking, cleaning and dispersing costs will be established in relation to the technological results.

5.4. The aim of the fourth phase will be to establish plans for converting existing equipment for waste paper stock preparation in order to improve performance. The plans will be studied in close collaboration with the papermills concerned and with machinery manufacturers. On the basis of these plans, the mills concerned could convert some of their stock preparation equipment.

5.5. As soon as the conversions described in 5.4. have been made, a fresh analysis of the performance of the converted equipment will be made on the same lines as 2. and 3. A final report will present all the results and conclusions of the five phases.

6. Duration

Three years.

7. Estimated total cost.

The total cost of the project is estimated at 1.200.000 U.A.

RESEARCH TOPIC Nº 3

1. Title

De-inking, including the relationship between different types of ink and de-inking, and the treatment of effluent from waste-paper recycling plants.

2. State of the art.

The countries of the Common Market have a de-inking capacity of approximately 400.000 to 500.000 t/year compared with a world capacity of 2.5 to 3 million t (over 1.5 million/T thereof in U.S.A.)
These figures should be compared with the 32 million t of waste paper used throughout the world (USA : 13 million t; EEC : 10 million t). A considerable increase in de-inking could therefore be expected over the next few years in the EEC.
There are two main de-inking methods : washing and flotation. Research is also in progress into new techniques.
Whereas de-inking by washing is more widespread in the USA, the flotation process is dominant in the EC. But both processes have limits and drawbacks enough to justify continuing research on de-inking.

- De-inking by washing

Here the ink is removed from the fibres by a method similar to that used in washing clothes, the ink being separated by means of surface-active agents.
The waste paper pulp is first mashed, classified and then diluted. The washing is then done at a series of levels on wire gauze thickeners (Sidehill type) on washing drums,(the drum is covered with a sheet of wire gauze which retains the fibres whilst allowing ink and extenders to pass through) or in other systems for breaking material up into small particles.
Since a lot of the small components are entrained by this method the yield from the processes low - a figure of 65 % is often given for coated papers containing mechanical pulp. Another major inconvenience of this process is the high water consumption (in spite of recent improvements).

The largest de-inking plants using the washing process are in the USA, particularly in newsprint production (the American Company, Garden State Cy, has a capacity of 450.000 t).

- De-inking by flotation

The principle of this method is to produce a foam which contains the imputities and is easy to eliminate.
The ink is removed in two stages.

. Separating the ink from the fibre by mechanical and chemical action.

Most of the ink particles are detached from the fibres whilst the material is being broken down in the pulper, during which process chemicals are added.

. Floating off the ink particles released by physical and chemical action.

In the flotation cells the pulp in a stage of suspension, is mixed with air fed in by diffusers. The separated and emulsified ink particles are carried to the surface of the cell by air bubbles and there form a layer of foam separate from the suspension.
For newsprint the yield in de-inked pulp is 80-90 % but there is a considerable loss in fibres. Water consumption is less than for washing.

At present about 100 Voith plants exist, approximately 50 of them in Europe. Their installed capacity is about 750.000t. There is also some 15 Escher Wyss units, representing a capacity of 250.000 T.

- Other de-inking processes

Apart from these industrial de-inking processes, namely washing and flotation, experiments with new processes have reached a semi-pilot stage :

. de-inking using solvents (CHP method)

. de-inking by means of coagulation the ink and then filtering by centrifuge(method used in Poland and Czechoslovakia)

It appears that these processes still require deal of perfecting.
Various projects also cover :

. Improvements to the flotation method of de-inking (Swemac system);

. perfecting mixed processes combining the two methods of de-inking by flotation and washing.

3. Status of research in the Member States
(based on information supplied to the Commission)

France

- C.T.P (Grenoble)

  . Analysis of the de-inking process and its potential application to certain types of printed paper.

  . Analysis of the various stages -detaching of the ink and its elimination - bleaching

  . Problems relating to substrates and inks

  . Research on new processes.

- Private undertakings

  . Research on flotation de-inking by the manufacturer Ets. Lamort.

  . Société des Produits Chimiques Ugine Kuhlmann(which manufactures the Lorilleux range of inks as well as chemical products) is conducting research on de-inking products (peroxide, surface-active agents) and printing inks.

Germany

- Darmstadt

  Work on de-pollution of effluent from the paper manufacturing industry.

- Private undertakings

  Research on flotation de-inking by the manufacturers Voith and Escher-Wyss.

United Kingdom

- PIRA

  Work on effluent treatment.

- University of Surrey

  Study of various physical and chemical de-inking processes.
  Research on ink formulae.

- Private undertakings

  Research on washing de-inking by both Reed and Bowater (the latter in collaboration with equipment manufacturer Newell-Dunford-Watford Ltd).

Italy

- ENCC (ENTE NAZIONALE CARTA e CELLULOSA) Rome

  . Study of methods of fixing printer's ink on paper substrate and on the solubilization of the various substances used in the manufacture of ink.

  . Study of pollution due to substances used in the manufacture of inks.

- Stazione Sperimentale (ENCC Milan)

  Effluent treatment methods.

Netherlands

- TNO (Delft)

  Dispersion of certain types of inks (thermoplastic inks) in the context of work in decontamination.

4. Expected results.

Savings in important raw materials can be expected as a result of :

- making greater use of de-inked pulp in the manufacture of newsprint;

- extending the use of de-inked pulp to grades other than newsprint (magazines, printing and writing paper).

In addition, a reduction in the amount of pollution caused by de-inking will be obtained.

5. Detailed description

5.1. Analysis of the de-inking process

Stated in its simplest form; the de-inking process is a combination on the following three basic stages ;

- detaching the ink

- eliminating the ink

- bleaching (if necessary)

A basic study of the surface physics and chemistry as regards fibres, inks, and the two in combination, is essential for an understanding of the phenomena. As a result of this study it should be possible to specify which products are best adapted to which stages.

The study willttake account of the wide range of raw materials available on the market, namely :

- the types of substrate (fibre composition, presence and type of coating)
- the printing process
- the composition of inks

5.1.1. Adapting the de-inking process to existing inks

- by improving present techniques
- by undertaking research on new and better techniques

5.1.2. Adapting inks to the de-inking process

Perfecting new ink formulas.

5.1.3. Potential uses for de-inking pulp

Depending on the raw material and the process used, the pulp will be characterized from the point of view of :

- quality (optical, mechanical and other properties)
- net cost (operation, investment, yield).
- Optimizing the quality of paper in which de-inked pulp is used and deciding in what grades of paper de-inked pulp could be used.

5.2. Ecological problems

5.2.1. Liguid effluents

Apart from the standard problems encountered in the manufacture of paper, there is the further problem that effluents contain chemical additives used in the de-inking process (detergents etc..) and certain components of the solubilized inks, some of which may have a not insignificant toxicity.

Help from ink manufacturers will be essential if these problems are to be studied (point 5.1.2.).

5.2.2. Solid waste

- Determination of the properties of the sludge
- Dehydration of waste with a view to making transport cheaper
- Possibilities of re-using waste (in paper-making or other branches of industry
- Selective recovery of fibrous and mineral substances.

6. Duration

Three years.

7. Estimated total cost

The total cost of the project is estimated at 1.600.000 U.A.

RESEARCH TOPIC Nº 4

1. Title

Use of urban fibres, including technological characterization of fibres in solid urban waste and health problems caused by the use of recycled fibres.

2. State of the art.

One of the basic techniques in the handling of urban waste is to extract various reclaimable products, including urban fibres to be used in the form of pulp by the paper board industry in particular. Semi-industrial and even industrial pilot plants are already in operation, using a variety of techniques. However, the quality of the pulp is still mediocre and it can only be used for low-grade board production.

Research is in progress but is not very advanced. Experience to date has pinpointed the following problems :

- relatively low quality of urban fibres

- irregular and heterogeneous composition

- presence of contaminants and non-fibrous constituents.

These drawbacks restrict the use of the small volume of urban fibres currently marketed to corrugated paper and other packaging grades of paper. The use of urban fibres in mixing with other fibres is to be expected when the available supply increases. However, this increase will depend on the answer to a different question; the relative advantages of sorting solid urban waste so as to recover its constituents (urban fibres, metals, organic constituents, glass, plastics) and of other methods of upgrading such waste.
The technological characterization of solid urban waste must therefore be regarded as an important issue calling for careful investigation owing to the lack of knowledge of the subject.

3. Status of research in the Member States
(based on information supplied to the Commission)

Several experiments in progress in the Community could be used as a starting point for a joint research programme.

In the Netherlands a project using a pilot installation on the semi-industrial scale is under way.

In Italy two towns (Rome and Perugia) have industrial installations (two in Rome) processing solid urban waste and producing pulp (urban fibres), ferrous metals, organic fertilizers (compost), dry feeding stuffs, glass and energy.

Other research activities relating more specifically to the paper industry are in progress in the United Kingdom (in particular the separation of contaminants in urban waste paper).

in France (in particular improvement of the quality of reclaimed urban fibres),

in the Netherlands (in particular the recovery of paper from household refuse), and

in Italy (in particular the improvement of the quality and extension of the use of urban fibres to different grades of paper).

4. Expected results

(a) Improvement of the quality of urban fibres and increase in the number of paper grades which they can be used;

(b) as an indirect result, speeding-up of the construction of waste processing plants, thus increasing the urban fibre supply;

(c) Reduction in waste disposal costs for local authorities;

(d) Reduction of pollution by solid waste.

5. Detailed Description

5.1. The aims of the project are as follows :

(a) Determination of the range of composition of urban fibres taking account of different population features in different regions

(b) Examination of the technical limits to the recovery of urban fibres;

(c) Examination of new techniques of recovering urban fibres.

5.2. The following programme, divided into three main parts, is proposed.

5.2.1. Solid urban waste (this part of the programme is included pro-memoriam since the required data will be obtained, in principle, from studies carried out by other bodies)

(a) Characterization and classification

(b) Feasibility study taking into account the technical and economic aspects of various alternatives for the use of solid urban waste.

(c) Determination of basic criteria for the construction of new machinery and apparatus for the treatment of urban refuse in order to separate waste paper.

(d) Economics of processing solid urban waste to obtain urban fibres; scale of production and related problems.

5.2.2. Urban fibres

(a) Characterization and classification : determination of quality index;

(b) Contaminant separation, with special reference to the separation and removal of adhesives from paper;

(c) Fractionation processes to improve drainage and papermaking quality

(d) Other procesess to upgrade the quality of urban fibre.

(e) Mixing of urban fibres in paper stock and study of the influence of the presence of urban fibres in different grades of paper and board.

5.2.3. Health problems

(a) Determination of harmful products that may be present (bacteria, toxic heavy metals)

(b) Study of sterilization processes

(c) Technology of bacteriological purification of waste paper pulps

(d) Evaluation of the health hazard due to the presence of contaminants in finished paper products which may come into contact with food-stuffs and liquids for human consumption.

5.3. Possible future developments

After completion of the three-year programme, developments could be envisaged in close cooperation with the Advisory Committee on Waste Management and its working parties, namely with regard to the preparation of a feasability study on the recovery of urban fibres from solid urban waste. This study could be followed up by pilot-plant tests on different types of waste in various regions of the Community in order to classify and characterize them from the view point of urban fibres recivery.

For the pilot plant experiments it appears best to use several pilot plants in different regions. As there are already some plants, construction costs (which are extremely high) are not included in the project. If in the course of the project a decision were to be taken to develop and set up new plants, the costs would have to be reviewed accordingly.

6. Duration

Three years.

7. Estimated total costs

The total cost of the 3 years project is estimated at 1.300.000 UA.

PROPOSAL FOR A COUNCIL DECISION ADOPTING A MULTIANNUAL (1978-1980) RESEARCH AND DEVELOPMENT PROGRAMME FOR THE EUROPEAN ECONOMIC COMMUNITY IN THE FIELD OF PAPER AND BOARD RECYCLING (INDIRECT ACTION)

THE COUNCIL OF THE EUROPEAN COMMUNITIES

Having regard to the Treaty establishing the European Economic Community, and in particular Article 235 thereof
having regard to the proposal from the Commission
having regard to the Opinion of the European Parliament
having regard to the Opinion of the Social and Economic Committee

- whereas Article 2 of the Treaty establishing the European Economic Community assigns to the Community the task of promoting throughout the Community a harmonious development of economic activities, a continuous and balanced expansion and an accelerated raising of the standard of living ;

- whereas in its Resolution of 14 January 1974 on a first action programme of the European Communities in the field of science and technology, the Council stated that the whole range of available ways and means should be used as appropriate, including indirect action ;

- whereas the Community paper industry depends to a great extent on third countries for its supply of raw materials and thus it is in the Community's interest to increase its self-supply potential and to improve the technologies for the recovery and recycling of waste paper and board ;

- whereas the Council of the European Community and the Representatives of the Governments of the Member States meeting within the Council adopted on 17 May 1977* a resolution concerning the continuation and implementation of a European Community policy and action programme on the environment

* OJ C-139, 13 June 1977.

- whereas a Community research programme in the field of paper and board recycling could contribute effectively to the achievement of the above-mentioned objectives, particularly by increasing the rate of recycling of paper and board and improving the quality of recycled paper;

- whereas the European Parliament adopted on 19 April 1977 a Resolution on the supply of raw materials to the Community;

- whereas the Treaty establishing the European Economic Community has not provided the necessary powers;

- having considered the Opinion of the Scientific and Technical Research Committee (CREST) concerning the proposal from the Commission;

HAS DECIDED AS FOLLOWS

Article 1

The European Economic Community shall carry out over a period of three years from 1 January 1978 a programme of research and development in the field of paper and board recycling as described in Annex A to this Decision. Annex A forms an integral part of this Decision.

Article 2

The upper limit for expenditure commitments and for staff necessary for the implementation of this programme is evaluated at 2.9 million units of account and 2 staff, the unit of account being defined in accordance with the financial regulations in force.

Article 3

The Commission shall be responsible for the implementation of the Research and Development Programme. To assist it in this task there is hereby established an Advisory Committee for the Management of the Research and Development Programme in the Field of Paper and Board Recycling.

The terms of reference and the composition of this Committee shall be as set out in Annex B to this Decision.

Article 4

The information resulting from the execution of the programme shall be disseminated in accordance with Council Regulation (EEC) nº 2350/74 of 17 September 1974 adopting provisions for the dissemination of information relating to research programmes for the European Economic Community(1).

Done at ,

For the Council
The President

(1) OJ No L 255, 20.9.1974, p.1.

ANNEX A

Research topic I :

Characterization of reclaimed fibres, their upgrading by various processes, and the effects of multiple recycling on paper making fibres.

Research topic II :

Elimination of the detrimental effect of contaminants in waste paper, including the dispersion of thermo-softening contaminants.

Research topic III :

De-inking, including the relationship between different types of ink and de-inking, and the treatment of effluent from waste paper recycling plants.

Research topic IV :

Use of urban fibres, including technological characterization of fibres in solid urban waste and health problems caused by the use of recycled fibres.

The research will be carried out under contract.

ANNEX B

Terms of reference and composition of the Advisory Committee for the Management of the Research and Development Programme in the Field of Paper and Board Recycling

1. Without prejudice to the Commission's responsibility for the execution of the Programmes, the Committee has the task of contributing, in its advisory capacity :

   - to the optimal implementation of the research and development programme in the field of paper and board recycling, and in particular to the detailed definition of projects as well as to the assessment of results ;

   - to the gradual co-ordination of all Community and national research activities within the area of waste paper recycling.

2. The Committee formulates opinions, prepared by the Secretariat and submitted to approval by the Committee. Every Committee member can ask that his view be recorded in these opinions. These opinions are transmitted to the Commission and a copy to the Council. CREST and its Sub-Committee will be informed periodically on the work of the Committee.

3. The Committee includes :

   - representing the Member States, three members appointed by each government for the duration of the programme on the grounds of their competence in the matter ; as far as possible, one of them should be responsible for the national research and development programmes in the field of paper and board recycling ; if it considers it necessary, each delegation may be accompanied by experts ;

- representing the Commission, three officials appointed by that institution.

Exceptionally, with the agreement of all the parties represented, special exceptions may be made to these conditions.

4. In the case of those representing the Member States, a member's term of office comes to an end in the event of his death or resignation, or if the government which appointed him asks that he be replaced. His successor is appointed for the remainder of the initial term of office.

5. The Committee appoints its own chairman, on a proposal from the Commission delegation and for a period of one year.

6. Secretarial services for the Committee will be provided by the Commission.

FINANCIAL DATA

1. BUDGET CHAPTER : 3365

2. HEADING OF THE BUDGET TITLE : programme of research and development in the European Communities on paper and board recycling (1978-1980)

3. JURIDICAL BASIS : Article 235 of EEC Treaty
Council Decision

4. DESCRIPTION, OBJECTIVES AND JUSTIFICATION OF ACTION

4.1. Decription :

Paper and board recycling

Research programme carried out by means of cost-sharing contracts with research organizations in the member states, in the four following research areas :

1st topic :

characterization of reclaimed fibres, their upgrading by various processes, and the effects of multiple recycling on paper making fibres ;

2nd topic :

elimination of the detrimental effect of contaminants in waste paper, including the dispersion of thermosoftening contaminants ;

3rd topic :

de-inking, including the relationship between different types of ink and de-inking, and the treatment of effluent from waste-paper recycling plants ;

4th topic :

use of urban fibres, including technological characterization of solid urban waste and health problems posed by the use of recycled fibres.

4.2. Objectives :

To help solve the problems of raw materials supply for the paper industry by increasing the potential for recycling paper and board and allow a better utilization of several kinds of old paper resulting, consequently, in a more efficient adaptation of raw materials to the final products.

4.3. Justification :

There is a need to increase sources of raw materials for paper making in view of the great dependency of the Community industry on the outside world and the resulting impact on the balance of trade. The most promising approach is to increase recycling and upgrade the qualities of recycled products. Environmental advantages will also accrue from the resulting reduction of wastes and the alleviation of water pollution problems.

5. TOTAL FINANCIAL INCIDENCE OF ACTION DURING THE TERM ENVISAGED (in EUA)

5.0. Funded :

- on Community budget	2,900,000 EUA
- by national administrations) - by other sectors	2,650,000 EUA
Total	5,550,000 EUA

5.0.0. Multiannual term

Commitment

	1978	1979	1980	1981
Staff	71,100	76,788	82,476	
Manag.	29,000	31,320	33,640	
Contracts	1,399,900	891,892	283,884	
Total	1,500,000	1,000,000	400,000	

Payment

	1978	1979	1980	1981
Staff	71,100	76,788	82,476	
Manag.	29,000	31,320	33,640	
Contracts	199,900	691,892	1,483,884	200,000
Total	300,000	800,000	1,600,000	200,000

5.0.1. Evaluation method
(included multiannual previsions)

a) Staff expenditure

The needs are estimated to be 2 staff for this programme.

1978 - 1980 (3 years)

1 category A staff
1 category C staff

In addition to staff number estimates, the evaluation takes account of the data of the Council Decision of 21.12.1976 on the adaptation of salary of European Community staff and applicable correction coefficients, adding to it - on a hypothetical basis - possible needs originating from the general evolution of prices in the Community.

The rates adopted are those used for the calculation of the three-year forecast 1978/1980. The evaluation of expenditure increases up to 1981 has been made on the basis of the following indices : 1978-108, 1979-116, 1980-124, 1981-132.

b) Contracts expenditures

In view of the nature of the subject and the qualification of the contractors, a uniform method of evaluation cannot be established.

In any case, the Advisory Committee, provided by the Draft Decision (art. 3) will be consulted of the allocation of funds.

5.1. Incidence on the funds :

- Community income tax on staff

- Functionaries contribution for retirement fund

6. FUNDING OF ACTION

6.0.

6.1.

6.2.

6.3. Funds to be included in future(s) budget(s)