



**160th CSO Meeting 1st-2nd December 2004
Proposal for a new COST Action**

COST E48

"THE LIMITS OF PAPER RECYCLING"

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DRAFT

MEMORANDUM OF UNDERSTANDING for the implementation of a European Concerted Research Action designated as

COST E48

"THE LIMITS OF PAPER RECYCLING"

The Signatories to this Memorandum of Understanding, declaring their common intention to participate in the concerted Action referred to above and described in the Technical Annex to the Memorandum, have reached the following understanding:

1. The Action will be carried out in accordance with the provisions of document COST 400/94 "Rules and Procedures for Implementing COST Actions", the contents of which are fully known to the Signatories.
2. The main objective of the Action is to develop scenarios which describe the future use of recovered paper within the European paper industry in order to provide a better background for focussed research activities in the field as well as to facilitate investment decisions or future company strategies concerning raw material markets.
3. The economic dimension of the activities carried out under the Action has been estimated, on the basis of information available during the planning of the Action, at Euro 30 million in 2004 prices.
4. The Memorandum of Understanding will take effect when it is signed by at least five Signatories.
5. The Memorandum of Understanding will remain in force for a period of four years, calculated from the date of the first meeting of the Management Committee unless the duration of this Action is modified according to the provisions of Chapter 6 of the document referred to in Point 1.

Technical Annex

COST E48

"THE LIMITS OF PAPER RECYCLING"

A Background

A1 Recovered Paper: an indispensable raw material for the European paper industry

Paper recycling has now been practised for many decades in numerous countries across the world. The paper industry is counted among those branches who almost perfectly meet the expectations of society with respect to the sustainability of their raw material base, the environmental compatibility of their processes as well as the recyclability of their products and has done so for a long time. In particular the latter argument has dramatically improved the image of the paper industry throughout the last few years.

In 2003 more than 165 million tons of recovered paper and cardboard were used in the production of some 325 million tons of new paper and cardboard. Nowadays about 40% of the raw materials involved in papermaking in the US and Europe is recovered paper, with the rest being mainly wood virgin fibre, additives (12-15%) and other non-wood fibres (1-2%). It is estimated that, by 2010, about half of the global amount of fibres used in papermaking will be recycled fibres. In Europe, recovered paper has become a major raw material representing 46% of the total volume of the raw materials used by the paper industry, and representing a recycling rate of more than 51 % in 2003, figures which were virtually inconceivable a couple of years ago. CEPI, the Association of European Paper Industries has agreed on a target of 56 % by 2005.

The driving force for this world-wide phenomenon was economics as well as the lack of other resources in some areas rather than ecological considerations, although rising problems with managing ever increasing amounts of private and municipal waste also made their contribution to this development.

There is no doubt that recovered paper as a raw material for the paper industry is here to stay. There should also be no reasonable doubt, that utilising used paper products of an acceptable quality as raw material for new paper and cardboard is by far the most economical and ecological strategy compared to alternatives like thermal utilisation or even burning. An efficient and robust long term strategy for recovery, reuse and recycling of materials is a cornerstone for improving the sustainability of the industry and the society.

A2 Quality of Recovered Paper determines its future utilisation

One of the decisive criteria for the future utilisation of recovered paper is its quality. This is a rather complicated function of :

1. The amount of undesirable components in the recovered paper.

This could either be inherent components of paper products like adhesives, plastic films, metal foil laminations and the like, or simply dirt or waste unintentionally collected together with the paper products. The paper industry does not have much influence on this factor – in contrast to those who recover the paper and even more to those who design paper products. In the past the

paper industry has made pleas to develop consciousness of this crucial area – with limited success so far.

2. The state of the art of recovered paper treatment technologies.

This is a very dynamic area. The suppliers are constantly, and successfully, undertaking huge efforts in order to increase the performance (and the profitability) of their products in terms of selectivity, capacity, reliability and to develop new products – usually without considering the overall economics of the recycling process.

3. The accepted level of impurities in the finished pulp.

This is not really an adjusting screw as the quality of the finished paper product isn't either. I.e. the quality of the finished pulp decides for which purpose it can be used, not the other way round. But of course, the lower the quality is, the more limited the use.

4. The accepted level of residues produced during recycling.

This is an area largely dominated by laws, ordinances, regulations etc. but also by the means available to those who produce the residues. The regulations governing the disposal of waste will however undoubtedly become even more rigorous.

In the past the paper industry has always managed the problems associated with paper recycling very effectively. The menace of water based inks, the problems of sludge disposal, the increasing problems caused by stickies a.s.o. to name a few. But all this happened at recycling rates, at least in Europe, which were significantly lower than those we would possibly have to deal with in a couple of years.

The many lessons on recycling which the paper industry had the opportunity to learn throughout the last few decades may be summarised as follows:

- The quality of the individual fibre deteriorates in the course of time. There is no number of cycles by which the life span of a fibre could be characterised in a meaningful way – although such attempts have been made. This is due to the fact that the quality of a recycled fibre depends mainly on the wood species and the pulping process as well as its former individual history. On the other hand, an excessively recycled fibre might be of absolutely no use in a high quality kraft paper while it still could do a brilliant job as a natural filler in low grade graphic paper.
- Recovering and re-using paper as a raw material for the paper industry results in the establishment of a partially closed (new paper–old paper-) loop. Like in all such systems the consequence is the build-up of concentrations of all, possibly detrimental, matter which is part of the loop depending on the degree of closure. In order to avoid a collapse of the whole system, kidneys (purification processes) have to be installed in order to keep the concentrations on a manageable level. This function is assumed by the recovered paper treatment techniques. In spite of all achievements these techniques are still far from being perfect.
- Increasing the utilisation rates beyond certain limits also requires the exploitation of resources which had not been used hitherto. These are in many cases of low quality or highly contaminated papers and cardboards. Even with highly sophisticated cleaning techniques the quality of the recycled pulp produced from this raw material will be limited – while yield will be low and the amount of residues produced during recycling, which have to be disposed of, will be high.

A3 The balance between prices, availability, demand and supply of recovered paper

Quality of recovered paper is only one decisive aspect of its attractiveness for the paper industry. The most important other ones are **availability and prices**.

Over the past few years, particularly in last century's mid 90ies, we have seen periods with insufficient recovered paper supply – at least in Germany and Austria. The reason at that time was an increased demand from East Asian countries which were ready to pay premium prices on international markets. The result was a shortage of recovered paper in Europe and a price level which motivated some manufacturers to restart their grinders. This however seemed to be only a temporary effect which eventually disappeared during the turbulent economic times in this part of the world in the late 90ies.

In the meantime the situation has changed again. The demand for recovered paper is getting stronger all over the world. The People's Republic of China is currently about to increase its recovered paper imports until 2006 by a factor of 6 within only 7 years. The same is probably true for Indonesia and a number of other Asian countries. The impressing number of new mills under construction or in the planning phase, many of which will be based on recovered paper, are a strong indication that unlike in the late 90ies, this time it will be the start of a permanent world-wide trend. This will undoubtedly have a strong influence on the world markets for recovered paper.

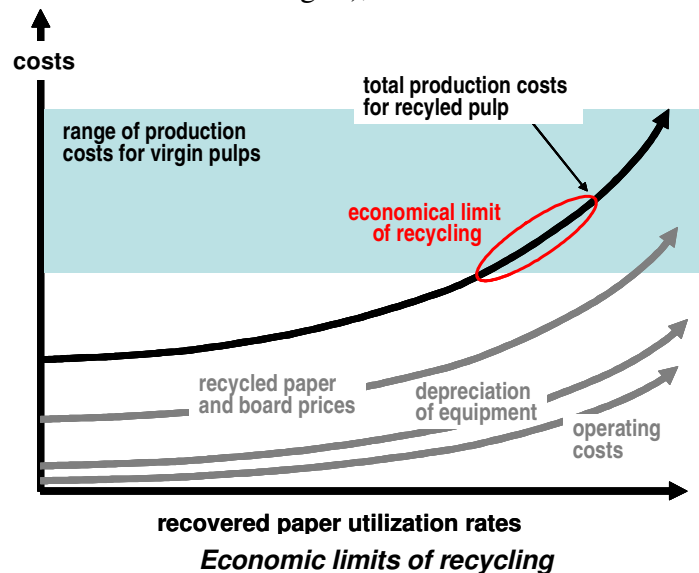
From all this it becomes evident, that there are limits of various kinds on the way and the intensity in which used paper and cardboard can be collected and recycled. Against this background a number of questions arise which remain unanswered for the moment but which might become extremely important in the future, maybe even in the very near future.

A4 Cross sectoral approach

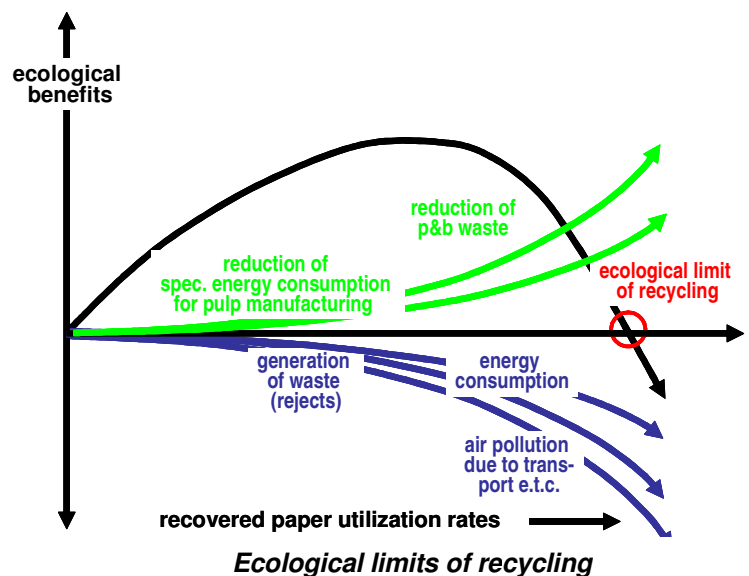
As stated above the attractiveness of recovered paper as a raw material for the paper industry depends on many factors, the most important of which are:

- **The economy of using recycled pulp** instead of virgin fibres. This is certainly a question of the price for recovered paper which itself is a function of:

- the availability (depending on collection and collection strategies),
- the quality (depending on composition and collection strategies) ,
- ratio between demand and supply on international markets (depending, among others, on shipping costs and legislation),
- the availability of effective and economically viable technologies for its preparation (depending upon R&D with the machinery suppliers),
- the possibilities and regulations governing the management of waste generated during the production of recycled pulp.



- **The ecology of using recycled pulp instead of virgin fibres.** This strongly depends upon the energy necessary to turn recovered paper into a competitive fibrous raw material. Equally important however is the waste produced during recovered paper treatment which in many European countries must no longer be deposited off in landfills but has to be incinerated. There are also additional environmental impacts resulting e.g. from air pollution due to transport, which have to be taken into consideration.



- **The acceptance of new recycling-based products** within the society. This was no problem a few years ago.

In the meantime however priorities have changed and environment is no longer on top of society's agenda. It must not be expected that the use of recovered paper will enjoy the same support from society which it enjoyed 10 years ago.

- **The contribution to the reduction of the waste problem.** This is neither an issue as it used to be a few years ago. In many countries landfilling of paper based products is no longer possible and incineration is regarded an environmentally compatible option. The pros and cons of this approach are still in discussion.

This short and incomplete list makes it obvious that predicting the future use of recovered paper and recycled pulp in the European paper industry requires a very comprehensive cross sectional approach including partners along the whole product chain as well as from other areas.

A5 The European perspective

Europe currently enjoys a fairly good volume balance in paper production and consumption. It can safely be stated that for most grades the quality demands in the West European market are equivalent or superior to the products offered in any other market and are met by the European paper industry. The threat, in the graphic paper area, coming from electronic media seems to be far less than anticipated a few years ago.

The main industrial threat for the European paper industry are probably large production units in tropical countries based both on fast growing hardwood (mainly eucalyptus and acacia) and recovered paper which is typically not available in those countries but has to be purchased from outside. Their products will be highly competitive partly also due to far lower costs for labour and energy.

This results in a threat to the European paper industry which does not only apply to the potential development of international prices for virtually all paper grades but also to a much stronger competition in international raw material markets.

B. Objectives and Benefits

The main objective of the Action is therefore to collect facts, data and experiences to develop on the basis of these scenarios which are able to – in a meaningful way – predict the future ecologically and economically optimised utilisation of recovered paper within the European paper industry. In order to do this it is important to identify ecological and economical limits beyond which paper recycling would no longer be a reasonable option. Once these limits are identified the paper industry will be in the position to undertake targeted approaches aiming at extending these limits – or to make in-time decisions to prepare for a gradual re-substitution of recycled fibres by virgin fibres. The availability of such well and comprehensively investigated scenarios are an important prerequisite for the European paper industry to undertake means which enable it to maintain an as high as possible level of sustainability and at the same time remain competitive in world markets. Thus the way will be paved for targeted approaches in various fields, the aim of which is to safeguard the raw material base for the European paper industry for which recovered paper plays an important role and, at the same time help the industry on its way towards full sustainability,

The benefits of the outcome of this action will be:

- a sound base
 - for targeted research activities on recovered paper treatment technologies
 - providing arguments necessary for the discussion with governmental organisations and the government in order to avoid further obstacles reducing the attractiveness of recycling used paper products
- guidelines for the design of recycle-friendly paper products
- guidelines for more effective, tailor-made collection strategies for used paper products
- a background for investment decisions taking into account likely changes in raw material markets...

In order to achieve these benefits, it will be necessary to collect data and gain a better understanding of the following fields:

- mid-term development of the European paper industry's raw material markets
- expected improvements in existing process technologies as well as expected new technologies arising in:
 - machinery (particularly recycled pulp treatment techniques with improved selectivity as well as techniques by which fibre properties can be regenerated)
 - process technology (control techniques, quality management, sensors etc.)
 - process chemistry(not necessarily restricted to de-inking processes)
- mid-term development of quality standards for all major paper and cardboard grades, including upcoming new qualities
- pros and cons of established or planned collecting systems
- quality of recovered paper resources not yet exploited
- the future composition of recovered paper with respect to potentially detrimental substances
- feasible development in national and European legislation relevant to paper recycling.

C.1 Scientific Programme

C.1 Scientific Areas

To achieve this goal it will be necessary to co-ordinate the exchange of results obtained from nationally supported research activities within Europe in the following areas and to converge them into an as complete as possible picture of the future of paper recycling:

Scientific area 1: Limits governed by the Characteristics of Recovered Paper & Cardboard

(Resources, recovery and quality of used paper & cardboard products)

This implies the characterisation and evaluation of

- the potential quality of existing resources for recovered paper and cardboard as well as those which might additionally be exploited in the mid or long-term,
- the impact of foreseeable trends in paper converting and paper finishing on the quality (recyclability) of the product
- the various strategies for the recovery of used paper and cardboard products
- the impact of these recovery strategies on the quality of the paper recovered

Scientific area 2: Limits governed by pulp preparation technologies

(Treatment technologies of recovered paper: State of the art and perspectives)

This implies the

- assessment of the state of the art and future potentials of recovered paper pulping techniques as well as those for cleaning and improving recycled pulps (this not only includes machinery but also the chemicals used for these process steps as well as process operation strategies (design of process chains including sensor technology and control systems),
- identification of changes in the composition of recovered paper in terms of non-paper components, their accumulation and the microbial activities in extremely narrowed or even closed water circuits and the potential impacts of all these effects on both processes and product quality.
- the recyclability of different raw materials

Scientific area 3: Limits governed by market developments, legislation and sustainability aspects

(Market trends with respect to the future demand of paper grades and their quality requirements)

This implies the identification of the mid-term development of supply and demand of recovered paper, particularly through

- monitoring world-wide, mid- and long-term investment projects for new production capacities for recycled fibre based paper and cardboard,
- identifying current and future trends in legislation with direct or indirect impacts on paper and cardboard recycling,

- predicting the consumers' attitude towards recycling based products and the future importance of environmentally sound processes and products,
- evaluating future product quality requirements to be met by major grades or at least those relevant for recycling and their implications,
- assessing the potential contribution to sustained paper recycling by the converting industries, i.e. by the recycling-oriented design of paper and cardboard products.

C.2 Types of activities

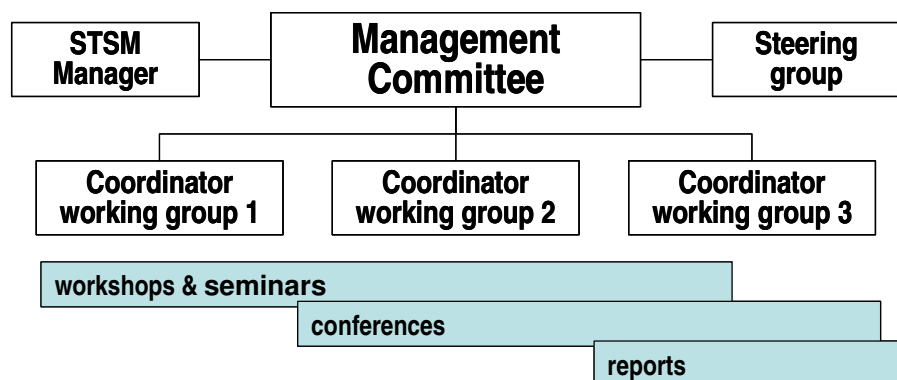
The Action will be in compliance with the general rules of COST and will include:

- workshops, conferences and seminars
- exchange of experts, scientists and graduate students for training
- exchange of reports, publications and experimental procedures
- state-of-the-art conferences and workshops
- joint projects in specific areas by two or more of the participants.

D Organisation and Timetable

D.1 Organisation, management and responsibilities

The organisational structure of the Action is depicted in the following chart. A Management Committee organises and controls the Action. Three Working Groups (WGs) will be formed (WG 1, WG 2 and WG 3) to cover the scientific areas. All WGs will organise seminars. Conferences will be jointly organised. Dedicated reports will be published by the WGs. A Short-Term Scientific Mission (STSM) Manager will organise and be responsible for the STSMs. The coordination of the time schedule as well as the contact with other COST Actions or potential partners will be organised by a steering committee consisting of the chairman of the management group as well as the coordinators of the working groups.



D.2 Working Groups

According to the scientific areas defined above, there various activities of the action should be organised and taken care for in three working groups.

Working group 1: The development of recovered paper quality

The focus of this group will be on

- the effects of modern converting technologies (including e.g. printing technologies and those by which paper and cardboard is combined with other materials) as well as market trends in the converting industry on the future composition of recovered paper in terms of type and amount of e.g. printing inks, adhesives, films and foils,
- the strategies by which paper is recovered and their impact on recovered paper quality, in particular in terms of its components (share of graphic papers, packaging papers and others) as well as non-paper material and impurities.

Working group 2: Treatment technologies and future recycled pulp quality

This group will focus on

- The assessment of existing and future recovered paper treatment technologies and their potential contribution to safeguard or even improve recycled pulp quality,
- The assessment of cleaning processes employed in the paper industry for the treatment of recycled pulps and the type and amount of rejects generated by these techniques,
- The development of techniques for the treatment of residues from recycled pulp stock preparation systems as well as their impact on further utilisation or disposal of the treated residues respectively.

This WG will work in close cooperation with COST E26 “Effective solutions to reduce the impact of wastearising from the papermaking process” as well as with COST E46 “Improvements in the Understanding and Use of De-Inking Technology”

Working group 3: Legislative aspects, market trends and societal issues

The objective of this group will be

- to monitor and assess the potential impact of legislative developments within the European Union as well as in their member countries on paper recovering or paper recycling (this includes e.g. waste disposal legislation, agreements on trade and tariffs, waste legislation)
- to collect data on the basis of which a better estimation of the world wide raw material supply and the world-wide demand on recovered paper can be made,
- to follow, assess and predict market trends which have an impact on the future demand for various paper grades,
- to predict the consumers’ attitude towards paper recycling in general and its readiness to use products containing recycled pulp rather than those made from virgin pulps.
- To assess recycling as a part of the strive for a sustainable society.

C.3 Timetable

The duration of the Action is four years. Each WG as well as the Management Committee will meet at least twice each year.

	year 1				year 2				year 3				year 4			
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
WG 1	WGM1		WGM2		WGM3		WGM4 +WS		WGM5		WGM6		WGM7			
WG 2	WGM1		WGM2		WGM3		WGM4 +WS		WGM5	+ open seminar	WGM6		WGM7		Joint WGM	Final Conference
WG 3	WGM1		WGM2		WGM3		WGM4 +WS		WGM5		WGM6		WGM7			

F Economic Dimension

Paper recovery and paper recycling plays an important role in many European countries, in particular in (utilisation rates for 2002 are given in brackets) Ireland (109), Spain (82), The Netherlands (82), Denmark (80), United Kingdom (74), Germany (65) and France (58). These countries already indicated their interest. The same will probably happen in some other COST countries.

On the basis of national estimates provided by the representatives of these countries, the economic dimension of the activities to be carried out under the Action has been estimated, in 2004 prices, at roughly Euro 30 million within the Actions perspective duration of four years.

This estimate is valid under the assumption that the 8 countries mentioned above but no other countries will participate in the Action. Any departure from this will change the total cost accordingly.

G Dissemination

As there are already a number of well established conferences and seminars in the area of paper recycling (PTS-CTP De-inking Symposium), CTP-PTS-Recycling Symposium, CTP-Advanced Training Course on De-inking) it will not be necessary to establish a new forum on which the results of this specific Action can be disseminated effectively. Since the emphasis of the majority of these already existing events is either largely or entirely on the technologies of paper recycling rather than market, societal or legislative issues it is planned to have at least one international seminar and one international conference covering these additional aspects. The working groups will organise one open mid-term workshop. An additional joint workshop of all WGs at the end of the action will help to synthesise the findings in the various areas and to melt them together into a meaningful prediction of the future of paper recycling within Europe. The purpose of this workshop will also be the preparation of the final conference.

Reports

Each working group will produce minutes of all meetings as well as an annual report summarising the work performed within the working group meetings. The presentations given in the various workshops will be published as far as this is possible. The MC (or a nominated Dissemination Group) will work out details of activities for publication and exploitation at the early phase of the Action. Scientific results will be submitted to international scientific journals and reviews.

Website

In addition to conventional scientific articles in professional journals, results of the Action will also be disseminated through the internet. An Action website will be established. The website will contain

- reports from the WGs,
- presentations given on the conferences and workshops organised within the frame of the Action

Cooperation between this COST Action and other Actions will be ensured. Equally important will be the communication with other European initiatives in the area, particularly the corresponding FP6 activities (Integrated projects and Networks of Excellence) like the ongoing IP ECOTARGET and the IP EFOORWOOD. Exchange of scientists and joint experimentation will be facilitated within the Action by Short Term Scientific Missions and at least five missions are planned for each year.

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ADDITIONAL INFORMATION
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