

# **WARM MIX ASPHALTS AND COLD RECYCLING FOR CONTROLLED USE OF EFFECTIVE ROAD TECHNIQUES REDUCING NUISANCES**

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## **ABSTRACT**

Road construction and maintenance impact directly users and resident activity. Typically, impacts are pollution, reduced road usage, depletion of resources, noise... Within the framework of its mission to promote innovation and development in road methodologies, Sétra, the technical department of the French Ministry for Equipment, is monitoring two modern techniques minimizing some of these impacts: pavement cold recycling, in situ or in the plant, and warm mix asphalts. Studies on these techniques show different states of progress. Cold recycling is in a final stage, whereas warm mix asphalts are still in an intermediate stage. A survey on the knowledge, practises and concerns of all players allowed to confront points of view of project owners, contractors, and users. It shows that creating an appropriate analysis base provides useful elements of reflection. This article aims at defining potential orientations and supporting action required for developing the use of these techniques.

## **1 INTRODUCTION**

The political, economical, and social environment of road infrastructures is evolving. The expression of users needs and the national strategy for sustainable development lead the French road owners little by little to an adapted policy.

Meeting these new issues, innovating techniques are developed and proposed by the civil engineering firms for several years. Hence, the owners have at their one disposal products which allow them to respond to today's concern.

More particularly, Sétra has monitored the evolution of one of these techniques: cold recycling. It has recently supported the development of a new process: warm mix asphalts.

Cold recycling has been subject to many studies, giving rise to writing of technical guides. These provide instructing parties with knowledge to control use, both in situ and in plant. But to what extent is cold recycling used and how can it evolve in the French context? Benefiting from a broad media coverage, warm mix asphalts are presented as the pavement material of the future. How can we control their use while maintaining their technical evolution?

A process of study, analysis, and design was implemented to answer these questions. First, we present how Sétra supports these techniques. Then, the confrontation of points of view from players in the road industry are analysed, to summarize the current situation. Finally, action under way and potential evolutions in these techniques will be exposed after this consultation.

## 2 SUPPORT OF THESE TECHNIQUES BY SETRA

Sétra is a department of the ministry for transport and infrastructure. Its first function is to produce and disseminate the French state of the art, but it also is supporting the public road owners by helping them in the creation, the implementation and the evaluation of their policy.

This involves permanent watch to evaluate the potential offered by evolution in techniques, as well as listening to different project owners, in order to adapt the state of the art to their specific needs and particularities of their networks. This also means orienting research, study and experimentation work, favouring innovation, then capitalizing their results and summarizing knowledge to formalise the state of the art.

In terms of road policy, one of today's major stakes is to reduce the impact of road works. Among the practical solutions identified by the Sétra to answer this concern, two techniques are promoted : cold recycling and warm mix asphalts.

### 2.1 Why are we interested in these techniques?

#### 2.1.1 *Cold recycling, an assimilated technique*

Sétra has shown interest in cold recycling for many years, as the original idea was to develop the "recycling reflex".

Cold recycling in situ of old pavements is a full in situ maintenance and rehabilitation technique of road structures, using the stock of materials recovered from the old degraded pavement. The process involves fragmenting the old pavement and adding some corrective aggregates and water, and then cold-processing the materials with a binder fed by a mobile machine. The added binder can be hydraulic or hydrocarbonated (typically a bitumen emulsion) or mixed (with a mix of bitumen emulsion and cement).

Treatment in a cold plant consists in deconstructing the body of an existing pavement either using milling tools, producing a material which can be used directly or with shovels and rock breakers, to produce crusts and slabs to be processed in a crushing and screening plant, in order to obtain a reusable material. Materials issued from milling, crushing and screening are of a highly varied nature, and hence their homogeneity must be checked before being processed in the plant. Therefore, they must be subject to prior studies and tests ensuring all their specifications are comparable to new pavement materials.

Cold recycling has "de facto" the benefits of recycling techniques: less non renewable natural resources used, road waste reused, less transport hence limited road network fatigue, but also indirect impacts (noise, smells, hygiene, safety). It also has the same benefits as cold techniques, more specifically a reduction in greenhouse gas emissions.

These different assets contribute in improving our life space, while notably reducing user embarrassment and nuisance for residents, a major concern for public authorities today.

Indeed, an in situ retreatment project reduces considerably road user nuisance, allowing traffic to be restored instantly and a shorter work time compared with a typical project. In addition, residential environment is preserved by the sharp drop in emissions due to transport and use of cold work. Constraints linked with the project's organisation are

lesser: the project owner no longer needs to integrate a detour route or lane unavailability time.

Cold recycling in a plant increases nuisance "close" to residents and road users, as it requires interrupting traffic. However, nuisance does not concern only that generated directly by the road works. Studies over these last few years in several projects have shown energy savings from 40 to 55% versus typical solutions, according to the type of formulation. This calculation is based on parameters such as production of aggregates from massive rocks and natural sand, milling, transport by truck, asphalt, manufacturing and laying. Energy saving reduces impact on the life space.

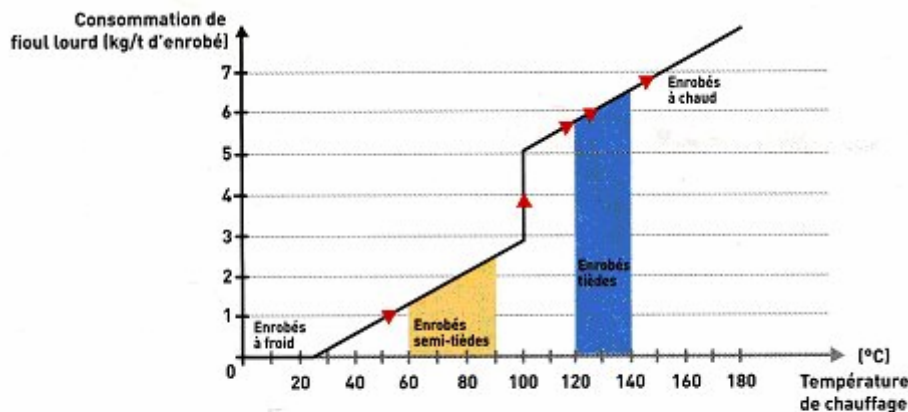
### 2.1.2 Warm mix asphalts, a promising technique for the future

Over the last three years, under different names, a new innovating technique has made its way in the French road landscape. Whether mixtures are called "warm", "semi-warm", "low calorie", "energy-saving", "low temperature", ..., each of these names designates a particular principle and common stake: reduce temperatures for manufacturing and laying versus typical hot mix asphalt, while maintaining mechanical properties close to these same mixtures.

No technique can be defined as being specific to warm mix asphalts. Whether these are "cooled" hot mixtures or "heated" cold mixtures, each intervenor develops a specific innovating process. The first data published however shows encouraging trends.

In the manufacturing process, temperatures were significantly lowered, and two categories already exist (figure 1) :

- So-called "warm" mix asphalt , with a manufacturing process at temperatures below those in typical hot mix asphalt ( ~ 130°C), while remaining above 100°C.
- So-called "semi-warm" mix asphalt, with a manufacturing process at temperatures below 100°C.



L'énergie nécessaire au chauffage d'une tonne de granulats humides n'est pas strictement proportionnelle à la température, car la transformation de l'eau de l'état liquide à l'état de vapeur consomme une grande quantité d'énergie, sans changement de température [chaleur latente de vaporisation ou enthalpie de vaporisation].

Figure 1 – Warm and semi-warm mix asphalts [1]

In addition, achieving these levels of performance is possible with current coating plant. At the most, a few modifications and/or additions according to the technique would be put on existing equipment.

Also presented as ecological products, warm mix asphalts offer energy gains far from negligible. According to data published in the press, energy bills in the plant and

greenhouse gas emissions are reduced by about 20% [2]. This figure reaches 40%, even 50%, in the case of "semi-warm" mix asphalts.

In terms of mechanical performance, behaviour of these materials, is similar to that in typical hot mix asphalt after three years lifetime. We still need to evaluate ageing and behaviour of these products over time. However, less heating the material allows to be optimistic concerning its lifetime.

In addition to the ecological and environmental aspect, this reduction in temperature and energy consumption results in lesser nuisance by the work sites. Both for residents and site workers, warm mix asphalts offer the benefit of emitting no fumes. In addition, traffic resumes faster after work than with hot mix asphalt.

All this information, available in the press [3-8], present a technique for the future which, thanks to many environmental benefits and its mechanical performance, is part of a "innovation approach" to reduce the impact of road works.

## 2.2 How are these techniques supported?

Setra has a role to play in inserting these cold recycling and warm mixture techniques into the French market. It is hence interesting to compare the approach used to monitor cold recycling with that emerging for new warm mix asphalts.

The various stages which monitor a product from its creation to its expansion are :

- The technique is tested in the laboratory
- This technique is monitored in a real-life situation
- The observations recognised allow to compile technical documents dealing with the presentation of these products
- The product can be the subject of a specific norm or be integrated into the current norm

### 2.2.1 *Cold recycling*

Cold recycling is currently a known technique, with well-defined mechanical properties. However, it is interesting to assess the means used to help and support the development of cold recycling.

Ever since it appeared in France in the 80's, cold recycling has been tested in innovating operations, performed within the framework of coordinated reinforcements. From the very beginning, the purpose was to support techniques saving on materials and energy.

Information notes [9-11] summarized this technique, its principle, its evolution, and the different steps in its development.

Cold recycling was also monitored by the technical observatory on pavements. This group of observers, formed within the scientific and technical network in 1992, ensured and maintained a high level technical watch, in the field of knowledge and monitoring, and in evolution in road cold recycling techniques.

The French Committee on Road Techniques (Comité Français des Techniques Routières) validated the performance of equipment for soil improvement and recycling old pavements by writing several Technical Assessment [12-14].

Collaboration work led jointly by the Scientific and Technical Network of the Ministry of Equipment and the road profession has led to writing two technical guides, published in 2003 and 2004, covering respectively "in situ cold recycling of old pavements" ("retraitement en place à froid des anciennes chaussées") and "retreading pavements and recycling asphalt-based materials" ("retraitement des chaussées et recyclage des matériaux bitumineux") [15,16]. These guides list existing practises as well as their interest, scope and limits of use, and provide information on prior studies, equipment, and checks.

Finally, since its origin, retreading has known strong evolution and stagnation periods. Currently, recycling with emulsion is booming in the secondary road network. Three techniques of this type are being monitored jointly with general councils, within the framework of the innovation approach.

The different processes for supporting cold recycling led over the last few years allowed to provide project owners with considerable information and recommendations concerning the technique and its applications. Although the benefits of this technique no longer need to be proven, only 10 % of the mass of recyclable mixtures are used today in manufacturing new asphalt mix.

### 2.2.2 *Warm mix asphalt*s

Warm mix asphalt are recent techniques. To optimise their support, the frame developed above must be followed, while taking advantage of current history in retreading.

Unlike cold recycling techniques, for which a full support process has already been implemented, warm mix asphalt are at a less advanced stage. Indeed, the technical community still lacks some history. Better feedback from road works is required to decide on the behaviour required in respect of these new products. In addition, most of the data remains confidential and corporate property. Therefore, no doctrinal element nor technical advice has been finalised on this type of mixture materials. Results are required in order to allow writing these documents.

Over the three years during which warm mix asphalt road works were multiplied over the French territory, State services have been active. Hence, a group of observers dedicated to this technique was implemented in 2006 and warm mix asphalt are also monitored within the framework of the "innovation process".

The assignment of observer groups is to consolidate the information available on this product, analyse it to define the additional research paths required, and propose a technical summary. As this report is being produced, the first summary note on this subject is being written, and should be completed in 2007. The points covered in this report are the technical monitoring, behaviour under traffic, environmental interest, scope of use, as well as a first quantitative summary.

Innovation in the field of warm mix asphalt was initiated in 2003, by the General Directorate on Roads (Direction Générale des Routes), supported by its technical network and a motorway concessionary company. It is a partnership with a road company, aiming at promoting research and innovation. In the monitoring work performed, the Scientific and Technical Network of the Ministry of Equipment is mainly interested in proper mechanical operation of warm mix asphalt, compared with typical hot techniques. Currently, three warm mix asphalt are monitored within this context, and one product has already been granted a proper completion certificate (Certificat de bonne fin).

### **3 DEVELOPMENT OF THESE TECHNIQUES IN THE FIELD: USE AND POPULARITY**

Cold recycling and warm mix asphalts are in different stages of progress. Although this first technique has strong support, the result, although positive, does not meet our expectations. To understand the reasons of this development and respond to difficulties met, and anticipate possible evolutions in warm mix asphalts, a survey programme was launched with certain roadwork professionals. A geographically representative sample of general councils, all local road services, and a few roadwork companies were consulted within the framework of our study. The purpose of the latter is not to be an exhaustive study, but to determine current trends in the national and local road network. These interviews and questionnaires provided knowledge on certain project owners, practises, obstacles to development.

#### **3.1 Communication**

##### **3.1.1 *Cold recycling***

Answers by project owners show that their level of knowledge in cold recycling is variable according to the geographical sector. There are two groups, with different levels of information. A first group, with most operators, manage projects in their sector and consider they have enough information on this technique. Their sources of information are mainly the specialized press, information notes, as well as the two guides published recently. A second group, a minority, states having no or very little information on the matter, in this case the only source of information is the specialized press. They are very keen on information and feedback, and also wish to manage a first project in their sector. In situ cold recycling techniques are better known and used more frequently than in plant.

The main benefits recognised by project owners are use of on-site materials, saving material resources, no pavement rising, and more naturally projects complying with sustainable development. Retreading in situ has given rise to specific responses, such as financial benefit according to the product implemented, reduction in transport and user nuisance, and finally the ability to work under traffic (alternate). There are no specific benefits pointed out for in-plant recycling.

##### **3.1.2 *Warm mix asphalts***

On warm mix asphalts, the level of knowledge is distributed quite diversely within the project owners consulted. Indeed, some of them consider they are not informed properly, and hence few are knowledgeable on the subject. Most of them claim they know about the development of this product, but lack information. Finally, a few instructing parties, and mainly those who have already managed warm mix asphalt road works, consider they have the necessary and sufficient knowledge on the product. Sources of information of project owners are the specialized press, exchanges as well as communication and information campaigns by companies. Therefore, the elements known are mainly descriptive of the technical and environmental characteristics of products. The lack of information also results from the way products are prescribed in public markets, as well as experience in road works already completed.

This shows that warm mix asphalts are considered as ecological and environmental, but costly, materials. The points noted are reduced energy consumption, user nuisance and improvement in working conditions on the work site due to lesser heat, reduction in greenhouse gas emissions (including CO<sub>2</sub>), as well as reduction of fumes and early traffic restoring. A question remains unanswered for instructing parties: what is the product's durability ?

## 3.2 Practises

### 3.2.1 *Cold recycling*

Project owners having already performed recycling road works note that this technique is not proposed often enough by companies when responding to a market. However, some of them suggest it in their market, by supporting the environmental aspect.

On their side, whenever possible, roadwork operators interrogated propose retreading solution. Here, several conditions are required: the market must be open to variants, the site materials must lend themselves to retreading techniques, the pavement in place must be well-known. They also have constraints due to their own equipment.

Having very little feedback on plant retreading work phase, we will cover only in situ cold recycling, which in fact is the technique being developed the most. Today, most companies have one retreading solution minimum. Project owners performing in situ retreatment work perform one to two projects per year on average. These mainly concern structural reinforcement. As results are highly satisfactory, this practise is also used by a few territorial authorities, particularly proactive in this field. However, the current trend does not show a significant increase in the use of this type of technique. It is interesting though to point out that certain techniques for low and medium traffic roads, with an interesting cost, are currently booming.

### 3.2.2 *Warm mix asphalts*

The requests expressed by instructing parties appear as being low for handling road works in warm mix asphalts. In spite of propositions by companies, only a few territorial authorities support these techniques. Nevertheless, the current trend is an increase in the production of these materials and the number of projects over the last two years (although this remains marginal). In addition, these projects are diversifying. Warm mix asphalts are now used in moderate to high traffic roads, both in rehabilitation/maintenance and new work.

Whenever possible, warm mix asphalts seem to be proposed regularly in public markets. Most sales arguments are ecological and environmental. They also take into consideration the impact and nuisance of the works, while guaranteeing mechanical properties achieved are similar to those of typical hot mix asphalt. This is proven by the fact that typical formulation and reception tests are performed. In addition, the latter are added punctually with certain measurements of emissions in the plant and energy consumption.

The conditions of performance of these works and acceptance of companies listed are:

- Heavy constraints in terms of service restoring times
- Confined environments, e.g. in a dense urban environment
- Local political will to consider the environmental aspect
- Local political will to participate in the development of new techniques
- Obligation of performance of works in non-summer periods.

## 3.3 Obstacles to development

### 3.3.1 *Problem of comprehension between project owners and companies*

Of course, developing these techniques requires using them, and hence managing road works. Companies who wish to test their new products try to have such road works, but seem obviously to be meeting project owners who are hesitant, hard to convince. The

owners are still sceptical about these techniques on which they don't have enough knowledge. Most of the time they prefer to have more history, and wait for other projects to be completed before going ahead. This need for a guarantee, while justified, does not block practise, but slows it down considerably.

### 3.3.2 *Problem due to the technique*

Cold recycling is known and mastered by contractors. However, as with any technique, it has specific limits and constraints. When analysing the answers in the questionnaire, certain of these constraints appear as actual obstacles for the development of the technique. First, structural designing this type of maintenance sometimes poses problems, cases of failed road works have been listed. Although this feedback is rather minor, it must be underlined and considered for future processes. In addition, the presence of buried networks and necessity to perform prior base course recognition studies are also an obstacle to more recurrent use of retreading. These points are highlighted both by project owners and roadwork operators, as they contribute to increasing cost and "heaviness" of preparatory studies. In addition, the local context has all its importance in the expansion of cold recycling. In certain sectors, the presence of quarries with a high aggregate supply capacity leaves little room for developing recycling techniques. On the other hand, according to the proximity of the equipment used, contractors cannot propose all cold recycling techniques over the entire French road network. Finally, in plant recycling road works give rise to direct organisation problems. They usually require closing the traffic lane worked, hence interrupting traffic, during a time, which varies according to the size of the road work. When this interruption is supported with information to users and residents on the fact it is a recycling project, response is positive.

Technical problems linked with warm mix asphalts are uncertainties inherent to any new product. Indeed, compared with typical mix asphalt, already broadly proven, warm mix asphalts have been used only for several years. The low amount of data available on actual behaviour noted in road works is often detrimental to using warm mix asphalts. For example, the young age of road works completed has to date not shown the behaviour of warm mix asphalts over time. In addition, although existing material installations are usually sufficient to produce warm mix asphalts, certain products require slight additions on this equipment. This limits the extent of the potential work zone to proximity with these installations.

### 3.3.3 *Environmental care versus economics*

These processes are supported for their ecological and environmental properties. Although these properties are a central concern, consideration of these parameters is not paramount compared with other stakes, mainly economical. Indeed, the high price of these products (except for certain retreading techniques) makes them difficult to sell compared with more traditional techniques. The price required to protect the environment is not quantified, it remains highly subjective and variable. Also, the reduction in nuisance due to the project on residents and users is not integrated clearly into the criteria for choosing a contractor's proposition.

In addition, the French mix plants are mainly hot mix plants. The reconversion of this national equipment generates highest costs. The consequence of this is that the hot mix plant are more attractive (because of their productivity increase) than the cold mix techniques.



Also, quantifying environmental characteristics is unusual in a project checking. It is difficult to analyse arguments such as the global reduction in nuisance justifying the choice of a technique.

## **4 ACTIONS AND PROCESSES TO PERFORM**

In order to promote the French technical skill and expertise in the road field, actions were taken along three main directions: a new information distribution, a quantification of reduced nuisance, and appropriate technical support. Work has already been initiated on these issues, other remains to be performed. It aims at optimising existing known processes, better supporting technique, and be closer to project owner expectations.

### **4.1 A new distribution of information**

The study led has allowed to note that information distributed on cold recycling has not reached all its target, and that project owners need information on warm mix asphalts.

Communication action common to these two techniques is organized to reach all instructing parties interested by these techniques. Hence, regional information events are being prepared, in order to sum up the knowledge acquired on cold recycling and warm mix asphalts, present feedback, and describe the supporting documentary frame.

Also, warm mix asphalts do not have the same technical background as cold recycling. An information process specific to the latter is hence implemented. This requires:

- Sending information notes to the different technical departments of project owners.
- Broader distribution of information notes through the French Road Safety Committee (Comité Français pour les Techniques Routières).
- Adaptation of documents supporting writing of market documents
- Writing a technical guide

In addition, an information note summarising cold recycling techniques is being prepared, to provide project owners with a simple and synthetic document on this broad issue.

Finally, discussions are indispensable with project owners to define jointly a durable and suitable organization for information distribution.

### **4.2 Quantification of reduction in project impacts**

In terms of the environment, the need for a defined impact quantification method appears clearly. Overall, project owners wish to have simple means for comparing the effects of different techniques on the environment and on the reduction of disturbance for users and residents.

Currently, means do exist for evaluating the environmental impact of road works, but these are not suited to generalized use. Life cycle analyses consider all elements related with energy consumption and the environmental nature linked with the entire lifetime of the product, from manufacturing to processing as waste. Although measurements are comprehensive, analysis is very long, and is inappropriate for site inspections, which are much more punctual. In addition, many measurements exist and allow to assess risks for the environment when performing the work. However, these tests are performed in an opportunist way and chosen according to the appreciation of each operator.

Therefore, the following is required to meet the expectations specified:

- drawing up an inventory of all these environmental tests,
- selecting among them those with an application compatible with the practical context imposed by road works,
- then choosing a methodology for environmental monitoring which can be used by project owners during the projects while relying on meaningful, fast, reliable, and low cost tests
- writing, publishing and distributing a guide corresponding to this methodology.

Also, user and resident nuisance due to the works are not highlighted sufficiently in technical documents. Nuisance comprises elements which are noticed through observation rather than concrete and material measurements, such as: difficulties linked with a technique, work performance, comprehension of laying and traffic interruption times; but also environmental issues, such as odour or sound nuisances.

The elements reported rely more on the appreciation and eye of the project technician, as quantitative comparisons are very difficult considering the diversity of project specifications. However, all this field information must be collected to provide a global view of a work site's impact on life space. For environmental measurements, these concern the methodology, explained below, difficult to implement.

Therefore, our structures must allocate more important space in our different structures with impact on all users and residents, which de facto concerns all "customers" in the road industry.

### 4.3 Appropriate technical support

#### 4.3.1 *Cold recycling*

Initially, appropriate support of cold recycling requires regular technical watch tasks. The latter exists since retreading appeared, it must be continued, maintained, and even reinforced to ensure close monitoring of its evolutions. This technical watch is ensured today by the scientific and technical network of the Ministry for Equipment, in charge of sharing feedback in its geographical sector, by relying on an internal Web application. This organisation allows defining and adapting the technical doctrine to reality in the field.

Then, support must respond, on a daily basis, to project owner expectations and requirements, and hence analysis on the technical aspect. To meet concerns of instructing parties at the closest, several directions must be studied, and developed by all players the road sector:

- In situ retreading of pavement using processes allowing to work without prior inspection of the existing structure
- Development of fast and cheap in situ retreading techniques on low traffic roads
- More concrete set of arguments on saving natural resources and on cost allocated to the environment
- Better definition of structural design calculation rules on these techniques

#### 4.3.2 *Warm mix asphalts: managing technical monitoring*

Current support of warm mix asphalts must not be revolutionized. Within technological watch, the "innovation process" and observer groups actually provide indispensable objective data. Nevertheless, this support must be adapted to technical evolution to be ready in a few years.

As described in the first part of this article, innovation is a process based on promoting and checking new techniques. But after a certain period, the techniques concerned clearly have increasingly less need for recognition through this vector. With better control, they no longer require proving within the framework of innovation. This process must be applied whenever possible, and this evolution anticipated while also maintaining the capacity of monitoring these techniques through observer groups. These can hence compensate a lack of data, and allow to extend monitoring of warm mix asphalts organized by public services.

Therefore, observer groups must be provided with more support. As described previously, their current role is mainly bibliographical: they collect and summarize information. To ensure they can evolve soon, the framework of their mission must be renewed, and means made available to them. Hence, documentation work must continue, but supported with a census of existing projects, while specifying their conditions of performance (nature of the network, traffic, location, road alignment ...). Among all these projects, those considered more appropriate will be followed technically, using the set of tests for checking typical surface characteristics (visual surveys, measurements on texture, grip, coring if necessary ...) and their behaviour over time.

Finally, in addition to organizing technical monitoring, the development of new test methods must be helped, to reach more refined ageing characterization of these materials.

## **5 CONCLUSION**

Cold recycling and warm mix asphalts are two worthwhile road techniques. Besides a reduction in greenhouse gas emissions, they enable to cut down on energy consumption and to lower road works impacts, especially user embarrassment, smells and fumes. These techniques show different states of progress : the one is already well known for many years, the other one is just introduced in the road industry. As they are central environmental today's issues, they are constantly in research and development stages in order to conform to the practical reality and the road players expectations.

The study, led within assessment of the perception of cold recycling techniques and warm mix asphalts by different road players, has shown that it is useful to intervene to support their development on several points. The issues retained are the need for broader information distribution means, the definition of a method for qualifying road works impacts, and the design of a technical monitoring process close to reality in the field.

To achieve this, strong proactive actions are engaged, such as the organisation and management of regional information events, or still devising a simple, reliable, and cheap method for evaluating environmental impacts of road sites. In addition, a simple and short information note specific to cold recycling is being prepared, to summarize this technique. Promoting innovating processes applicable without prior survey of the base course is also recommended. For warm mix asphalts, their support imposes the implementation of new action within the observer group, to produce a technical guide in the long run, which can be used directly by practical staffs.

Furthermore, those two process are of a great interest to the international road community. The French approach is to be compared with the one of other countries. On one hand, cold recycling already has an international technical framework. For example, a technical guide [17] has been written by the international road community. Each country carry on improving and perfecting the technique. At the same time, some cold recycling

development statements are getting to emerge. All these assessments have to be shared in order to enlarge the use of this technique all over the world. On the other hand, warm mix asphalts are being world-wide developed tow [18,19]. Civil engineering firms and laboratories are constantly searching for possible evolutions of this new material. Several international partnerships do already exist. There is a need to carry on this actions in order to provide a mastered use of this promising techniques in the long run.

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