Innovation implementation in road contracts

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1. Introduction

In general the European road market is very national. Each country has its own materials specifications, construction design procedures and contractual specifications. A major consequence of this is the presence of barriers to the exchange of technological knowledge, products and experiences from one country to the other. Even with the introduction of European standards such barriers are likely to remain in due to the understandable reluctance of the several parties involved in road building & management to accept experience from other countries.

EAPA has taken the view that it is in the interest of both the European road industry and the European road authorities to consider foreign experience with novel products and pavement constructions which to optimize the technical/economical aspects of road management.

EAPA believes that it is the task of the industry to promote initiatives that develop a structure in which mutual recognition of experiences obtained in different countries is assured. For that reason within this paper an idea is presented on how to obtain a structure where products are verified at national levels in such a way that their transfer to other countries is facilitated. It is described how such a structure can be based on existing systems in Europe and how individual EAPA-members can promote the development of such a structure in their country. It is also described how such a structure fits into the European standardisation and legislation structures.

2. Existing systems of innovation implementation

In two member states systems are operational to facilitate the implementation of innovations in the road building industry. These are: the technical advice system “Avis Technique” and the innovation implementation system “Charte d’Innovation” in France, and the “Highway Authorities Product Approvals Scheme” (HAPAS) in the U.K. In Annex 1 a more detailed description of these systems is given.

Major points of interest in these systems, which are considered to be important for the proposed innovation transfer system are:

- The innovation development is done by the industry. The road authority may describe his wishes in terms of performance (Charte d’Innovation) or may accept novel products which the producer has proven to have equal performance quality compared to conventional products (Avis Technique, HAPAS).
- The proof of the performance quality is based on known technology: functional test methods, accepted construction design models etc.
- The verification of the performance quality is done by independent bodies. These bodies are formed through mutual cooperation between road authorities and industry.
- When a product is accepted, the field of application, the performance characteristics and practical experiences are published.

3. European developments

A structure of innovation exchange between different European countries must fit into European legislation. In this field the developments related to the implementation of the Construction Products Directive are relevant. The EU-CPD (Construction Products Directive) is interpreted in most states as requiring that construction products (including bituminous materials) placed on the European market to bear a CE-mark which proves that the products fulfil the Essential Requirements of the CPD. The CE-marking can be based on European Standards or on an ETA for the specific products.

Based on the CPD European standards for bituminous materials currently being developed include quality control requirements; it is anticipated that these standards will be incorporated in national standards from 31/12/2006. This means that from that time the exchange of technology will be facilitated, as the products are described in the same technical language: i.e. the same product descriptions, the same test methods, the same quality control principles.

The European standards for bituminous materials only cover "standard" bituminous mixtures: asphalt concrete (AC), AC for thin layers, mastic asphalt, stone-mastic asphalt, porous asphalt, soft asphalt and hot rolled asphalt.
For non-standardized products (products for which no European Standards are available) the ETA-system has been developed to provide the possibility for such products to obtain the required CE-marking. The meaning and the applicability of the ETA is described in Annex 2.

Note 1: CE-marking is not quality marking. This means that one cannot rely on the specific technical performance quality of the product in specific situations: only the Essential Requirements are covered by CE marking.

Note 2: In both cases no novel products, no construction concepts etc. are involved. For novel products a specific ETA may be required; for constructions no CE-marking is required. At this moment the European legislation does not require the development of European Standards for pavement constructions.

4. Proposal for the structure of a reliable innovation transfer system based on mutual trust

EAPA considers the following facts to be essential for an innovation transfer structure for Europe:

- An innovation transfer structure should be supported both by the road authorities and the industry in the countries involved;
- The structure should offer the possibility of maintaining the actual division of responsibility for of the performance quality of the products and the constructions, the job execution and the performance management of the road between the several parties involved;
- The structure should offer a means of calculating the risks of introducing the new technology for each party (both the financial and the derogation risks).

In this paragraph a general description of an innovation transfer structure is given. It is based on the three existing innovation exchange systems in member countries as described in section 2 above.

The systems as described are essentially applicable in the conventional contract situation in which situation the (public) road authority is responsible for the pavement design and management, the contractor for the construction job activities and application of the building products as specified in the tender documents. To apply innovative products or construction concepts in this relationship the contractor has to convince the road authority of the quality. However due to the specific public responsibility of these authorities it is often difficult to prove quality to the satisfaction of the road authority.
New contract relations are being developed all over Europe (see e.g. the EAPA-note "Asphalt Industry & Road authorities: Contractual Relations in the European Countries'), in which an integration of the responsibilities for the construction design, the job execution and the management is involved. In these "Functional Contracts" the road authority steps back from his technical activities and the contractor takes over these responsibilities. In that situation the application of innovations will be easier; however certainly in the transition period a sound proof of the functional quality of construction products and concepts will be required. The systems as described in this paper may facilitate this development.

A procedure by which road authorities, contractors and mix producers can incorporate products (which might be constituent materials, bituminous mixtures or full constructions) which are unknown to them in their operational activities should fulfil the following requirements:

- Public road authorities must be convinced that their public responsibility for road performance is not endangered;

- Contractors must be convinced that the (financial) risks they take by offering such a product to their clients are recognised and rewarded in a reliable way.

- There should be a mutual recognition of the responsibilities of each party: the responsibilities of the public road authority as a public institute, the responsibilities of the contractor as a private enterprise. (Detailed consideration and reallocation of responsibilities might be required when other parties are involved.)

To provide such a basis EAPA suggests the following procedure:

- A product should be described, related to its aimed function viz. its functional characteristics;

- The product performance should be described by European Standards (EN's) for the constituent materials and bituminous mixtures. (For non-EN-standardised products additional – national – descriptions may be chosen).

- The performance quality of the product in the country of origin should be described in an approved construction design model.

- The verification of the performance quality in the country of origin should be monitored by an independent body.

- In the country of implementation the road authority should describe the required performance characteristics of the pavement construction based on an approved construction design model.

- The proof of the quality of the product in the country of implementation should be done by the contractor.

- The verification of the claimed performance quality of the product should be done by an Independent Body in the country of implementation.

- The Independent Bodies in both countries should be controlled by:
  - the national industry;
  - the road authorities;
  - the national Approving Body.

  ("Independent Body": a body formatted by industry and road authorities in that country to monitor the performance quality of the innovative products.)

5. Conclusion

The increase in technological knowledge of road construction and road materials, the increasing exchange of knowledge between countries and the ongoing development of European integration offer new possibilities for the asphalt pavement community to facilitate the wider implementation of innovative products used in the individual EU-member states to obtain a technical/economical optimization of road management.

At present, where the conventional contract relationships between road authority and road contractor apply, such a process requires a trustworthy structure for transfer of products between countries, to give confidence regarding the claimed performance quality. Each party has its responsibility and the parties should respect that and each other. The public road authority has its specific public function and the road contractor has to care about his specific industrial economical basis.

Europe strives for the promotion of innovation in the building industry. EAPA sees possibilities for the asphalt industry to follow this policy. Within conventional contracting relationships the development of a structure as described will be helpful; in the situation of novel contracts the structure as described will facilitate the risk evaluation of companies implementing products used in other countries.

Annex 1: Existing systems in EAPA-member countries for implementation of innovations in the road building industry.

Currently in EAPA-member states three systems are operating which facilitate the implementation of innovations in the road building industry:

- the "Avis Technique"- system in France;
- the "Charte d'Innovation"-system, also in France;
- the "Highway Authorities Product Approval Scheme"-system in the U.K.

A. The Avis Technique system

In France a special committee exists called "Commité Français des Techniques Routières" (CFTR). This committee has a special sub committee, which is in charge of submitting "Avis Technique"-certificates for specific products to be used in road constructions. The sub committee is composed of experts from the French road administration and industry companies.

The initiative to obtain an Avis Technique is taken by a company. A company can ask for a technical advice (avis technique) for a specific product. To do so it has to supply a file including:

- A presentation of the product and the guarantee of the company either on the product's composition or its performance. The company can choose among the different criteria, but there are some minimum mandatory guarantees such as, for instance, main characteristics of the binder (penetration, softening point etc.).
- The results of the tests and a list of experiments or works in which the product has been applied.

After an enquiry on the sites, the sub committee delivers the technical advice.

The final advice is composed of the three parts (the two delivered by the company and the enquiry report of the sub committee). In this final advice the results of testing are described and related to standard reference values. These values can be used e.g. in an alternative pavement design to prove the equivalent quality of the construction with the innovative products compared to the original construction using standard products. (To do so a fixed design procedure is used: e.g. for the mechanical design the Alizé design procedure.)

B. The Charte d'Innovation system

The second French system is the "Charte d'Innovation"-system. This system is operated through cooperation of the national road authority (Direction des Routes) and the contractors organisation (SPETRF). The system contains two sections: the Charte d'Innovation Routière (dealing with road construction innovations) and the Charte d'Inovation d'Ouvrages d'Art (dealing with engineering structure innovations).

The initiative to develop an innovation is taken by the road authority, which indicates for which topic an innovation is required and describes the expectations of the authority for the innovation. Contractors may propose action on a certain topic.

A number of contractors are then invited to propose their ideas for meeting the requirement. They are asked to present:

- A description of a product, technique or material;
- A description of the application method;
- The results of tests and trials;
- The price;
- References of works that have been executed already with the innovation.

When the answer is acceptable to the road authority the innovation is then developed. Depending on the format of the innovation four steps are possible:

- Executing tests under laboratory conditions;
- Building a test section under laboratory conditions;
- Application in full scale projects for technical demonstration;
- Application in full scale projects for economical demonstration.

In the case of the full scale technical demonstration, the contractor is (partly) paid for the job. The road authority offers sites for application, eventually supports the execution by tests etc. and contributes to the (extra) costs of the application. When the performance of the innovation complies with expectations, the road authority delivers a certificate on the acceptable performance of the product.
When the innovation is not accepted, the contractor is informed about the conditions under which his innovation might be acceptable (e.g. in other applications or situations).
Also, the contractor can find sites to lay it at his own responsibility. With a number of sites and data (follow up, test results etc.) acceptably achieved, he can ask for an Avis Technique.

The full scale economical demonstration consists of a tender with alternative products in which the contractor can propose the new product. If his innovative product is less expensive than the reference solutions, the contractor will apply his innovation and so demonstrate the interest of his novel product.

C. The HAPAS-system

In 1997, faced with a growing number of innovative products rapidly coming onto the market, the main UK highways bodies, the Highways Agency (responsible for the National Trunk Road Network) and the County Surveyors' Society (representing the County Highway Authorities responsible for much of the remainder of the road network), set up the "Highway Authorities Product Approvals Scheme" (HAPAS) in conjunction with the British Board of Agreement (BBA).

For many years the BBA has been assessing and certificating proprietary products in the building and construction sector and has been chosen by the UK Government as the nominated body to issue European Technical Approvals (ETA's). BBA was therefore chosen by Highways Agency and CSS as the independent certification body to run the HAPAS scheme. Importantly, BBA are not experts in road materials, they are however professionals in running product assessment and approval schemes.

The HAPAS scheme

To date, the HAPAS scheme has developed assessment procedures for a wide range of highway materials, with a "specialist group" formed to develop guidelines for assessment of each and to advise BBA on technical issues. As far as road surfacing materials are concerned, the following apply:

Specialist Group 1	-	High friction surfacings
Specialist Group 2	-	Over banding and crack sealing materials
Specialist Group 3	-	Asphalt thin surfacings
Specialist Group 4	-	Modified binders and binder modifiers
Specialist Group 8	-	Permanent cold laid re-instatement material
Specialist Group 9	-	Colour retention test for road surfacings
Specialist Group 10	-	Resin bonded coloured surfacing

Each specialist group is made up of representatives from the Highways Authorities, the BBA and specialists from producers of the products.
The specialist groups have the sole job of developing guidelines for assessment and certification of the products, against which the BBA staff carry out the assessment. While the detailed requirements of

these guidelines obviously vary with the type of product there are usually six common stages of assessment.

These six common stages of assessment are:

Stage 1: Assessment of data provided by the proprietor (including details of the product or system, production and installation method statements, quality plan and any historic data on the product or system).

Stage 2: Agreement of Quality Plan and Assessment of factory production control (where appropriate, the product or system should be produced and or installed under a recognised quality assurance system, such as BS EN ISO9000 series but this system must incorporate the specific details in the quality plan).

Stage 3: Laboratory Testing (undertaken by a laboratory accredited to the United Kingdom Accreditation Service or separately accredited by BBA).

Stage 4: System installation trial to demonstrate the practicality of the process.

Stage 5: System performance trial to monitor performance in the road over a two year period. Survey of customers with two or more years experience with the product/system.

Stage 6: Certification, following which the supplier is subject to audit and review by BBA.

As far as testing is concerned, there is usually a series of mandatory tests to characterise the material and determine its functional properties that affect its general performance. In addition, there are a number of optional tests that can be carried out at the proprietor's request to assess additional characteristics that he may be claiming for the product. For example, in the case of thin asphalt surfacings, rut resistance and retained stiffness after water saturation are mandatory requirements, but tyre noise reduction and regulating ability are optional properties to be measured if the proprietor makes specific claims for these.

The implementation

These schemes have been introduced at the initiative of the Highways Agency (central government roads administration) and the County Surveyors Society and Technical Advisors Group (regional and local government roads administration). The policy of the Highways Agency is, in the case of products covered by HAPAS, to specify only HAPAS certificated products for use on roads for which the Agency is responsible. Similarly, the regional/local authority associations are encouraging those authorities to adopt HAPAS certificated products for the roads for which they are responsible.

The scheme took a long time to come into effect as far as asphalt thin surfacings were concerned but is now relatively mature.
There is some concern over the flexibility of the scheme to deal with improvements in systems, changes in bitumens, etc. but this has yet to be tested.

Annex 2: The ETA-system

An ETA for a construction product is a favourable technical assessment of its "fitness for its intended use" in the meaning of the CE-marking when no European Standards are available to describe the product characteristics. An ETA is based on the contribution made by the product to the fulfilment of the six Essential Requirements, as stated in the EU-"Construction Products Directive" (CPD) for the construction in which the product is installed.

An ETA can be granted when any of the following conditions apply:
- No relevant Harmonised standards for the product exist;
- No mandate for such a Standard has been given by the European Commission;
- The European Commission considers that a Standard cannot be developed (yet);
- A product deviates significantly from the relevant Harmonised Standards.

In conjunction with an "Attestation of Conformity" procedure (which is intended to ensure that the product specification set out in an ETA is maintained by the manufacturer), ETA's allow manufacturers to CE-mark their products (a CE-mark is required for all products put on the market within the EU viz. within the European Economic Area). A CE-mark (based either on European Standards or on an ETA) covers the Essential Requirements part of the product.

Although in certain circumstances it may be possible for an ETA to be issued on the basis of a common assessment procedure agreed among EOTA-members (members of the "European Organisation for Technical Approval", the registered Approved Bodies), in most cases an ETA for a product will be granted to a manufacturer based on the assessment principles set out in an ETA Guideline (ETAG) for the relevant product sector.
Depending of the required level of control a third party may be required to survey the compliance of the manufacturers' factory production control system to the required level as described in the Factory Production Control Standard for the product. This is the case for bituminous mixtures (EN 13108-series). Such a third party must be notified by a national government: they are known as Notified Bodies (NoBo's). (In many countries registered Approved Bodies are recognised as NoBo's.)

An ETA is limited to a construction product and does not cover construction concepts or construction techniques. For bituminous materials Harmonised European Standards are being developed for 7 types of mixtures: Asphalt Concrete, Asphalt Concrete/Very Thin Layers, Soft Asphalt, Hot Rolled Asphalt, Stone Mastic Asphalt, Mastic Asphalt and Porous Asphalt. So an ETA is not applicable for these materials. At present an ETA is being developed for ultra thin bituminous materials.

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