

ROADMAT: THE FIRST ONLINE ROAD MATERIALS DATABASE

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ABSTRACT

With the implementation of harmonized specifications in Europe since the beginning of the century, asphalt binders have become more and more standard all over Europe. In the meantime, consolidation in the refining industry has made binders travel more and more all over the continent, making it necessary to use a limited range of paving grades. This trend is now spreading to the rest of the World, since exports between neighboring continents keep developing. For example, European bitumen exports were nearing 50% of US imports in 2020.

In parallel, and in part because aggregate are local resources that don't travel much, asphalt mixtures keep being specified with local methods and specifications. Even if efforts are being made to standardize practices, especially in Europe, the way mixtures are formulated is generally pretty homogeneous at national level but with often marked regional differences. Thus, asphalt mixtures formulators rely more and more on additives in order to meet local technical specifications using more and more standard binders; Polymers are used to enhance the mechanical performance of binders, adhesion promoters come into play when bitumen-aggregate adhesion needs improvement, warm mix additives allow decreasing manufacturing temperature. If you now add emulsifiers (for all kinds of cold technologies encompassing chip seals, microsurfacing and cold recycling), fibres (to reduce binder drain-down in open graded formulas), acids (to boost binder properties), rejuvenators and even bitumen substitutes, the selection of proper additives become increasingly complex. Even new functionalities are repeatedly brought to the market like decontaminating products or odor suppressing agents for binders.

In this context, formulators need to find information on available additives and compare resembling products from a given supplier or from its direct or indirect competitors. RoadMat, the road materials database, was developed with the objective to just do this: gather and organize information on additives for formulators. It was launched online at www.roadmat.com in April 2019 and now contains more than 1,000 additives for asphalt mixtures and related road products. The traffic after 2 years of existence has now reached 5,000,000 visits per year, making it THE reference information site for asphalt formulators. This communication presents the way the database is organized and the available information. The focus on innovative solutions and future developments are also described.

1. INTRODUCTION

The RoadMat database (www.roadmat.com) was launched in April 2019. Traffic after 2 years has reached 5,000,000 visits, making it THE reference site for formulators of road materials. Its design has been optimized to be accessible from any device: PC, tablet, smartphone... The possibility of installing it as an application on a mobile device is described on the site.

The principle of this database is to make public, technical elements available to everyone. They were accumulated in past professional experiences, as formulator in a laboratory of a large road construction group, then as supplier of specialty products who studied the

competition. It has since been supplemented “in real time” to include the latest innovations from each supplier.

The database does several things:

- Discover the different products offered by a given supplier. Some suppliers have very extensive ranges, sometimes containing several dozen products,
- Identify different suppliers likely to offer a desired product,
- Compare products with each other.

This article presents how the database is organized and the available information. Orientation towards innovative solutions and future developments are also discussed.

2. CONTEXT

With the implementation of harmonized European standards since the beginning of the 21st century, bituminous binders have become increasingly standard products. At the same time, the consolidation of the refining sector has meant that binders are increasingly traveling on the continent, which has reduced the number of grades available. This trend is now spreading across the globe and exports of bitumen from one continent to another are increasing. As a result, bitumen from Europe represented 50% of imports into the United States in 2020.

However, and partly due to the fact that aggregates are local resources that travel much less, bituminous mixes are still formulated using local methods and specifications. Even if great efforts are made, particularly at European level, to standardize them, formulation practices rarely go beyond the national or even regional framework.

As a result, asphalt mix formulators require more and more additives to meet local specifications from increasingly standardized binders: polymers are used to improve the mechanical performance of binders, adhesion promoters are added to compensate for insufficient bitumen-aggregate bonding, warm-mix additives are incorporated to reduce application temperatures. If we also consider emulsifiers (for all cold technologies: surface dressings, microsurfacing or cold-in-place recycling), fibers (to limit binder drain down in open-graded mixtures), acids (to optimize the properties of binders), rejuvenators and synthetic binders, the selection of the right additive quickly becomes very complex. Not to mention that new features appear regularly, such as products that reduce air contamination or odors.

In this context, formulators need more than ever to be informed about the available additives. They must compare them quickly to choose among similar products from a given supplier or from direct or indirect competitors. This is exactly what the RoadMat database was designed to do. In addition to the focus on bituminous materials, it also includes products for earthworks (soil treatment, geosynthetics, etc.).

3. STRUCTURE OF THE DATABASE

In general, the database is centered on NON-standardized road products or additives, such as emulsifiers, polymers, rejuvenators... It currently lists more than 1,000 commercial products, for which supplier and main properties are identified.

3.1. Product families

In order to make it easier to find the relevant product, the products were organized into 5 families:

- Additives for anhydrous bituminous binders,
- Additives for asphalt mixtures,
- Additives for bituminous emulsions,
- Additives for soil treatment,
- Special road products.

"Additives for anhydrous bituminous binders" contains modifiers that are most often added to the binder at the refinery or in a dedicated plant. Likewise, "Additives for asphalt mixtures", contains additives that are most often added at the asphalt plant. Thus, liquid antistrips will essentially fall under this latter family because they are mostly added to the binder but at the asphalt plant. The other families are quite obvious, with "Special road products" gathering all products that couldn't find their way in any of the other families, like for example "Geosynthetics".

3.2. Types and categories

In a second step, products are gathered in types then in categories. For example, in the family of "Additives for bituminous emulsions", the type "Emulsifiers" is then divided into "Anionic emulsifiers", "Cationic emulsifiers", "Amphoteric emulsifiers" and "Co- emulsifiers".

3.3. Search engine

The database opens up as a search engine as pictured in Figure 1 below.

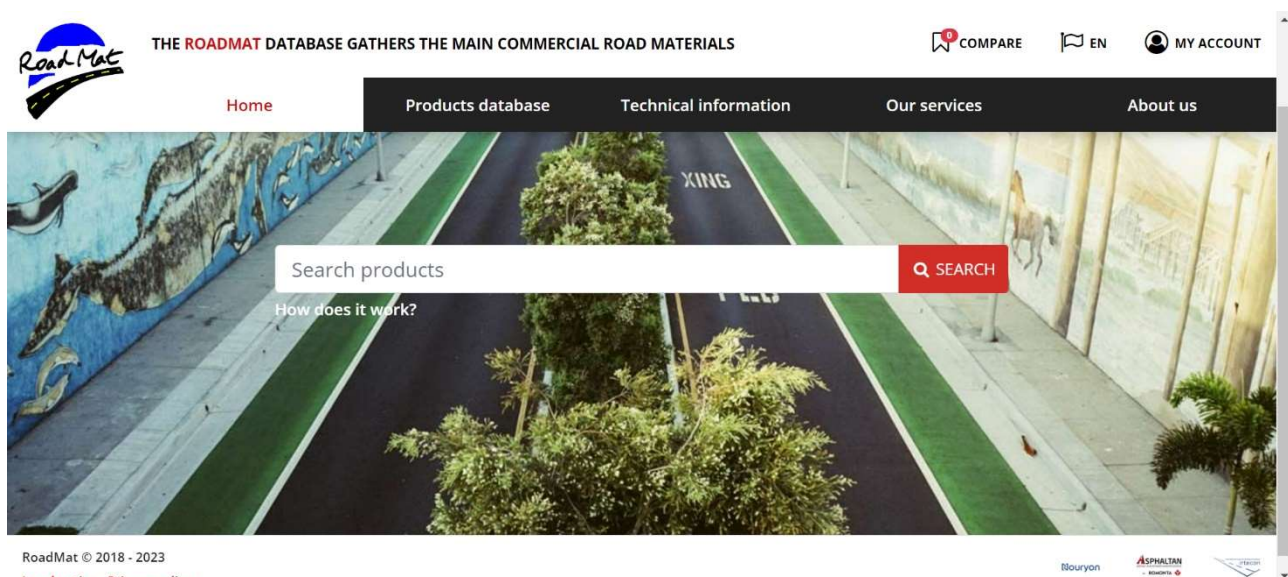


Figure 1: Homepage of the RoadMat website (www.roadmat.com).

The user can directly enter the commercial name of the desired product in the search bar (e.g. "Redicote E-7100", "Asphaltan A" or even "Top-Irtec") and the database will display the product sought if it is referenced. Otherwise, an error message indicates that the search is unsuccessful. The user is invited to refine his request or to contact the site via the address info@roadmat.com to inform of a missing product.

The user can also carry out a generic search by searching for e.g. "emulsifier" (Figure 2). A list of 127 matching products appears (Figure 2 left). The user can then open the sheet for one of the products on the list (Figure 3 – see the paragraph on the origin of the information

below). He can also reduce the number of products displayed by limiting his search, e.g. to the family of “Additives for bituminous emulsions”, to the type of “emulsifiers” and to the category of “anionic emulsifiers”. Only 11 products then appear (Figure 2 right). Similarly, a filter can be applied on the supplier to only see products from a given manufacturer.

The search is done on all the elements entered in the product sheets. It is thus possible to launch a search via a generic name (copolymer, wax, pigment, etc.) or an application (surface dressing, warm mix, etc.) or any other relevant keyword. Note that, even if the database is multilingual (English, Spanish and French), the properties are entered by default in English and then translated into French and Spanish. A search with an English keyword is likely to find more products, even if it is done on the French or Spanish version of the site.

The search engine is made to display no more than 15 products in order to force the user to apply filters.

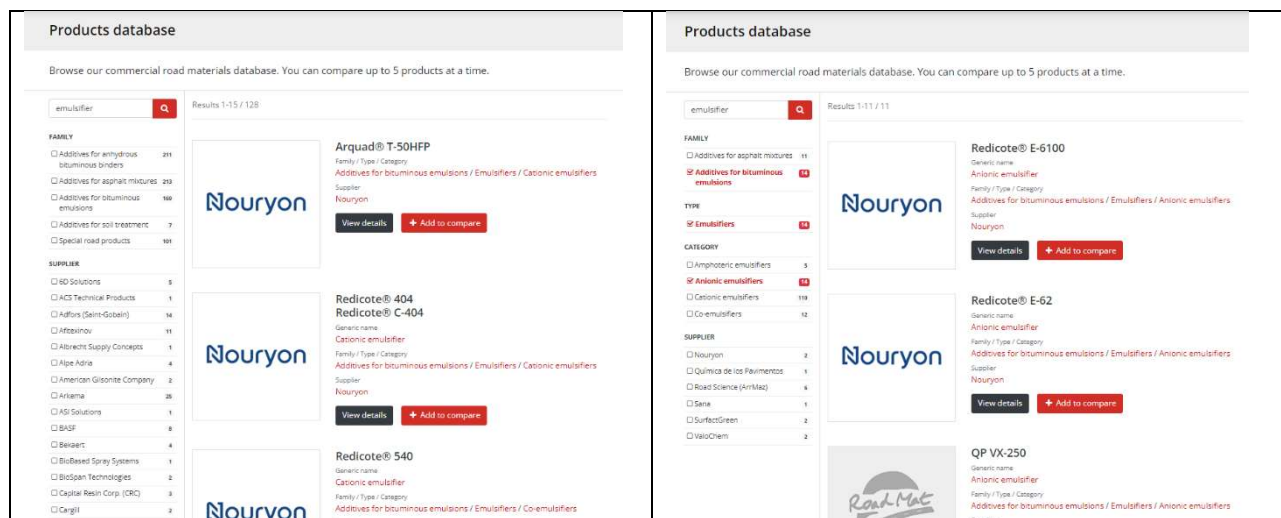


Figure 2 : Search results for « emulsifier » (left) and corresponding results when limiting the search to anionic emulsifiers with the appropriate filters (right).

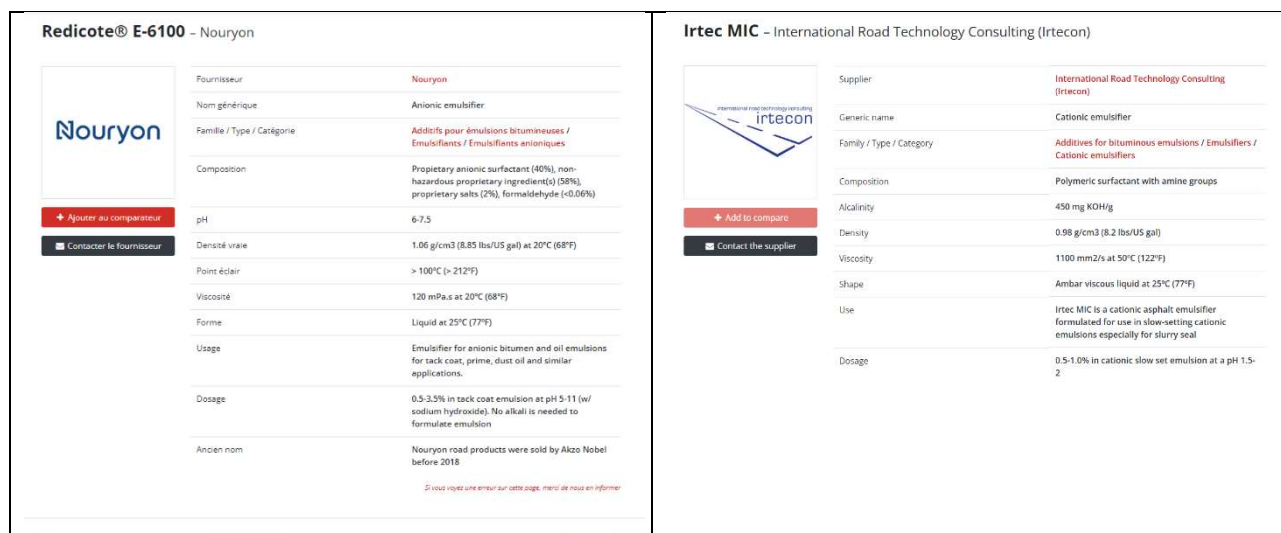


Figure 3: 2 examples of product sheets.

3.4. Product comparator

It is also possible to compare products (Figure 4), by choosing up to 5 of them, either in the list via the red button "add to the comparator" (Figure 2), or in the product sheet where a

similar red button also appears (Figure 3). To facilitate reading, it is possible to ask the comparator to highlight the fields presenting differences.

THE ROADMAT DATABASE GATHERS THE MAIN COMMERCIAL ROAD MATERIALS

COMPARE EN DIDIER LESUEUR

Home Products database Technical information Our services About us

Products comparator

Compare up to 5 products for road materials from our database.

Highlight differences remove all

| Redicote® E-6100 | Asphaltan A | Irtec MIC | [Free slot] | [Free slot] |
|--|--|--|---------------|---------------|
| Manufacturer: Nouryon | Manufacturer: Romonta | Manufacturer: International Road Technology Consulting (irtecon) | | |
| Generic name: Anionic emulsifier | Generic name: Montan waxes | Generic name: Cationic emulsifier | | |
| Family: Additives for bituminous emulsions | Family: Additives for asphalt mixtures | Family: Additives for bituminous emulsions | | |
| Type: Emulsifiers | Type: Warm mix additives | Type: Emulsifiers | | |
| Synonyms: Anionic emulsifiers | Synonyms: Waxes | Synonyms: Cationic emulsifiers | | |

Figure 4: Example of a comparison between products using the comparator.

3.5. Access and general conditions

Access to the RoadMat database is subject to prior registration. The formality is free. This situation is made necessary for essentially two reasons:

- The first is to avoid robot connections that would allow the site to be absorbed in a few seconds. It is thus a way to protect the intellectual property of the site,
- The second is linked to the general conditions of the site and allows the user to confirm that he has taken note of the conditions under which he accesses the information provided by RoadMat. The user confirms that he is aware that the information is published in good faith and that RoadMat does its utmost to ensure that the published information is correct and up-to-date but cannot guarantee the absence of errors. It is up to the user to validate the veracity of the data used if they present a potential risk in the event of an error. Also, any practical use of one or more information from the RoadMat website is performed under the unique responsibility of the user and RoadMat cannot be held responsible for any damages in connection supposedly with the information on the site.

Registration is encouraged by the fact that much of the information is only available to registered users. Thus, the data displayed for the products (Figure 3) is only visible after registration. Similarly, the content of the technical information (see paragraph 4) is only accessible after registration.

Of course, RoadMat applies the legislation in force concerning user data in connection with the European obligations described in the General Data Protection Regulations (GDPR).

3.6. Innovative Products

Innovative products are identified by a special field, “year of launch”. This field is not always filled in for old products because their launch date is not necessarily precisely documented. On the other hand, RoadMat takes care to note the year of launch of products that appeared recently and these therefore have this field filled in with a more or less recent date.

Also, the current interest in technologies with a low environmental footprint is reflected in the database by the systematic introduction of new available solutions. Products of bio-sourced origin (emulsifiers, regenerators, fluxes, synthetic binders, fibres, etc.) are thus widely represented [1].

4. ORIGIN OF THE DATA

In general, the database is centered on NON standardized road products or additives, such as emulsifiers, polymers, rejuvenators... In other words, and at the moment, there is only limited information on standardized products such as aggregate or bitumen. However, special grades of these are still documented, including non-standard grades such as clear or multi-grade binders.

The objective of RoadMat is to be as exhaustive as possible, both in number of products but also in product information. To do this, RoadMat organizes physical and digital monitoring to follow suppliers and detect new products. Users are invited to inform if a product is missing or if certain properties displayed are incomplete or incorrect.

The main source of information is the Product DataSheet PDS published by the manufacturer. RoadMat often retrieves them in electronic format from the sites of manufacturers or their distributors. A certain number of printed documents are also obtained from fairs or congresses. To ensure that the user has the most reliable information possible, RoadMat adds the link to the PDS on the manufacturer's site as often as possible. The user can thus see for himself how the manufacturer presents his product. This sheet is sometimes hosted on sites other than that of the manufacturer and RoadMat uses the link only if it seems reliable. The physico-chemical data of the products are retrieved from the PDS as well as the field of use and the recommended way to use the product (Figure 3).

A second source of information comes from Material Safety DataSheets (MSDS), which document compositional elements and certain physico-chemical properties. In the same way as for the PDS, a link to the MSDS on the manufacturer's site is added when available.

A third source of information, much less used, comes from articles or presentation materials. Depending on the credibility of the source, in particular whether or not the manufacturer was associated with the publication and/or whether the data comes from known laboratories in their respective countries, this data may be included in the product sheets.

RoadMat keeps the sources used to document the database. Despite this, several reasons can explain that a property is not documented (composition included):

- Unknown property,
- Known but undocumented property,
- Different contradictory values were found and no source seemed more reliable than the others,
- Property is documented but entering is in progress.

It should therefore be noted that hazard statements that are not completed do not necessarily mean that a product is not dangerous. It is also possible that we simply did not have access to the MSDS.

Finally, RoadMat's goal is to help find and compare products, doing our best to ensure that the information is as accurate as possible. Despite this, RoadMat cannot guarantee that the properties displayed are always correct and complete. Therefore, and as clarified in the

terms and conditions, users are solely responsible for how they use the database content and should therefore do so at their own risk. If in doubt, RoadMat always recommends directly contacting the supplier.

5. ADDITIONAL TECHNICAL INFORMATIONS

In addition to the database, RoadMat publishes additional information that aims to better understand the specificities of certain products and to facilitate comparison between similar products. This information is grouped in the "Technical information" menu and contains technical notes and case studies.

5.1. Technical Notes

Technical notes give a synthetic and pedagogical presentation of a subject related to some of the products in the database. They are based on solid technical and scientific publications [2,3,4,5] which are systematically cited so that the reader can further deepen his understanding.

By the end of 2022, the following technical notes had been published:

- How does the RoadMat database work?
- Asphalt binder specifications: performance vs penetration grades
- Principles of bitumen polymer modification
- How to choose an emulsifier?
- Can an old aged bitumen become new again? Or why use rejuvenators...
- Warm mixes: How to lower the manufacturing temperature of asphalt mixtures?
- Install the RoadMat App

They are first published in English and then translated into French and Spanish.

5.2. Case Studies

Case studies are also published to illustrate the practical use and interest of certain products. They may be adapted from previous publications, in which case the original source is cited. When applicable, RoadMat clearly mentions that the publication is sponsored. Indeed, the first case studies were associated with RoadMat sponsors (see next paragraph).

At the beginning of 2023, the following case studies had been published:

- Successful cold recycling project with Redicote E-7100 emulsion at Glen Elder, Kansas (USA)
- Successful chip seal application with Redicote C-580 emulsion at Mt Pleasant, Michigan (USA)
- Use of Asphaltan® product range to improve asphalt mixtures.

Just like technical notes, case studies are first published in English and then translated into French and Spanish.

6. MAINTENANCE, SPONSORING AND FUTURE DEVELOPMENTS

6.1. Maintenance, financing and sponsoring

The database is managed by a specially created French company, RoadMat SAS. Development and maintenance costs are borne by this company.

In 2022, RoadMat opened to sponsors who thus participate in maintenance and development costs. This allows continuing to feed and improve the site. All types of sponsors are welcome and the first generous contributors were Nouryon, Romonta and Irtecon. RoadMat warmly thanks them for their help and trust.

6.2. Future Developments

RoadMat's ongoing objective is to continue to feed the database and try to make it even more complete every day. New families of products will be considered as they are entered.

RoadMat plans to continue to publish technical notes on current topics, particularly in relation to recent innovations in the sector and thus help users better understand new additives that have appeared in recent years. This will be complemented by appropriate case studies.

Also, information on the various suppliers will be made available soon. Some specialized suppliers are indeed little known, especially in distant geographical areas, and RoadMat can help to make them better known.

7. CONCLUSION

The RoadMat database is a new tool made available to formulators of road materials since 2019. It takes on its full meaning in a context where demanding local specifications are required for materials that are often formulated with increasingly standardized components, like bitumen.

Its structure has been designed to facilitate the identification of products classified by their nature. A comparator makes it possible to highlight their common points and differences.

Additional information is added, like technical notes and case studies, aimed at better understanding the specificities and benefits of certain products.

With remarkable traffic from the first years, RoadMat has become a reference tool in the landscape of road materials. Its short-term objective is to continue to enrich the database, with a focus on innovative solutions with low environmental impact.

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