

Prevention of professional risks and materials of road construction

By Christine LEROY, Director of Technical Affairs of USIRF - French Road Construction Industry Federation

Abstract:

It is thus indispensable to become known better the know-how of the companies of road construction, its capacities to be answered the new environmental and societal stakes by reducing the consumption of natural resources and emissions of greenhouse gases and by protecting the biodiversity.

In protection of the health of the employees of the road building companies, the French road construction industry federation collaborates very actively for several years with public authorities in any transparency.

This abstract presents the current works led with the DGT (Directorate-General for Labour of the French Labour Ministry), the CNAM-TS (French National Health Insurance Fund for Salaried Workers), the ANSES (French Agency for Environmental and Occupational Health Safety), the INRS (French research and safety institute), the Occupational Medicine and the OPPBTP (French professional Agency for Risk Prevention in Building and Civil Engineering), among others:

- ♣ The implementation of a new website to present shares of improvement of the conditions of work or reduction of risks: measures of hazard assessment led in 11 construction sites with the CARSAT of Brittany and the INRS, concerning 7 companies and a binder plant, the influence of reduction of temperature in warm mix asphalt, the characterization of RAP for a reuse in new asphalt mixes;
- ♣ The updating perms of the list of the authorized fluxants used in certain road products; a guidebook was published in 2006 and regularly updated;
- ♣ The co-organization of a day of exchanges on the implementation in the companies of prevention measures on the risks NOISE and VIBRATION.

Keywords: Prevention, professional risks, health and safety, warm mix asphalt, characterization of RAP.

Definition of Acronyms used in this paper

DGT	Directorate-General for Labour of the French Labour Ministry
CNAM-TS	French National Health Insurance Fund for Salaried Workers
ANSES	French Agency for Environmental and Occupational Health Safety
INRS	French research and safety institute
GNMST-BTP	Occupational Medicine in Building and Civil Engineering
CARSAT :	Regional Health Insurance Fund for Salaried Workers
DIRRECTE :	Regional Departments of Consumer Affairs of Labor and Employment Ministry
OPPBTP :	French professional Agency for Risk Prevention in Building and Civil Engineering
FNTF :	French National Federation of Public Works
USIRF :	French Road Construction Industry Federation
CMR :	carcinogenic, mutagenic and reprotoxic chemicals
MSD :	musculoskeletal disorders

I – INTRODUCTION: the objectives

The DGT (Directorate-General for Labour of the French Labour Ministry), the CNAM-TS (French National Health Insurance Fund for Salaried Workers), the ANSES (French Agency for Environmental and Occupational Health Safety), the INRS (French research and safety institute), the Occupational Medicine and the OPPBTP (French professional Agency for Risk Prevention in Building and Civil Engineering) rally together to advance the prevention of occupational hazards in the road works.

Fields of improvement focus on:

- Prevention against chemical risk prevention and CMR (carcinogenic, mutagenic and reprotoxic chemicals);
- Prevention against MSDs (musculoskeletal disorders);
- Preventing against risks of exposure to solar UV.

This effort aims to promote:

- Sharing scientific and technical knowledge on the road materials and their uses;
- Joint development of new metrics and tools for analysis and monitoring studies of exposure to occupational positions, including bitumen fumes;
- Testing of systems to reduce at source emissions of gear and road construction equipment (e.g. pavers);
- Developing shared tools for monitoring statistics of occupational diseases and accidents;
- Establishing good practices in prevention and occupational health including recycling of road materials, implementation of the asphalt, or prevention against solar UV;
- Developing campaigns of information and training from repositories and safety datasheets intended for the companies networks and their regional associations, the CARSAT (Regional Health Insurance Fund for Salaried Workers), the DIRRECTE (Regional Departments of Consumer Affairs, Labour and Employment Ministry), regional delegations of the OPP-BTP and Health Services work.

2 – WORK ORGANIZATION:

In order to provide sensible improvement, several working groups were set up involving especially OPPBTP and representatives of GNMST-BTP. Work monitoring is sponsored by the French Steering Committee including all stakeholders and FNTP (French National Federation of Public Works).

The first meeting of the Steering Committee was held on January the 13th, 2011, the second meeting on June the 29th, 2011 and the third meeting on November the 30th, 2011. In the future, there will be two meetings per year. The secretariat is provided by the CNAMTS (French National Health Insurance Fund for Salaried Workers).

This collaboration is part of a broader partnership agreement on the implementation of Occupational Health in preparation between the FNTP, the Directorate General of Labor, the National Insurance Fund for Salaried Workers, INRS and OPPBTP.

This partnership agreement, in addition to the issues of prevention of chemical risks, MSDs (risks for musculoskeletal disorders), exposure to solar UV and road risks should also cover the implementation of other development fields such as safety training or prevention of psycho-social risks.

The working group for prevention against chemical risk has to:

- Raise awareness among construction companies on the issue and the need to remove, and if it is impossible to limit the chemical risk.
- To help companies to:
 - Identify hazardous materials and exposure situations, and to evaluate the associated risk.
 - Eliminate the risk including replacing unsafe products, especially CMR most commonly used by businesses, by less hazardous or non-classified dangerous substances.
 - In case it is technically impossible, reduce the risk by limiting the exposure levels of employees in particular by means of collective protection.

- Develop, disseminate and spread in conjunction with governments and official bodies to prevent the return of successful experiences of replacement and reduction of exposure.
- Explain to employers the arrangements for monitoring exposure.
- Establish the possible exposure values by type of activity or work situation
- Provide a guide for risk evaluation from exposure value by activity and implement appropriate preventive measures.

The working group on the prevention against UVs has published that UV exposure is not something reserved for public work activities and more generally for professional activities.



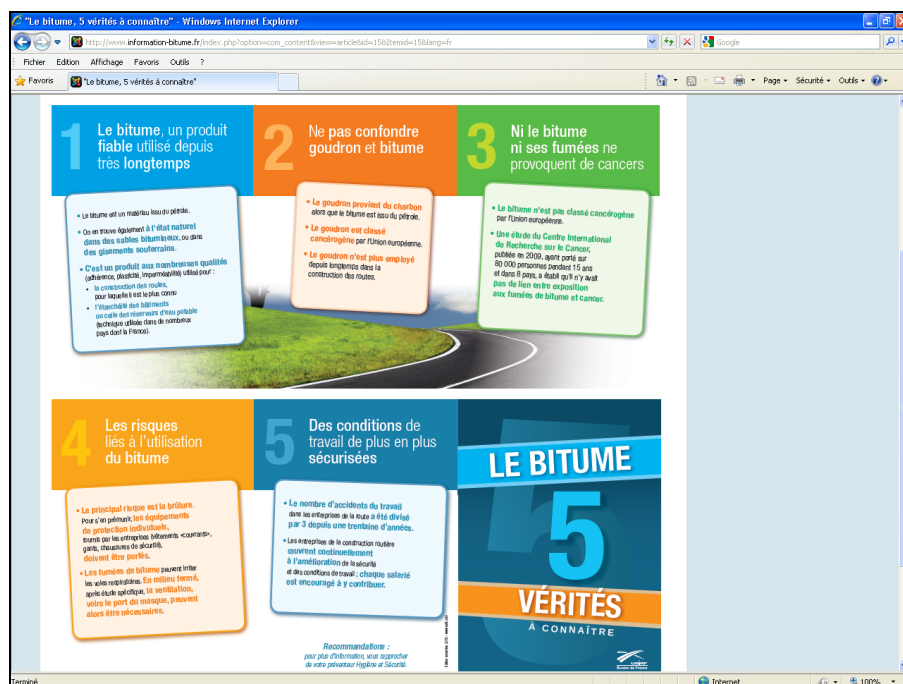
In order to ensure clear and consistent policy, the working group will propose preventive actions, including communication integrated in the action plan of the State Public Health (spot TV radio flyer).

First, a brochure was printed on the initiative of the USIRF called "solar UV, a health issue for all" to the attention of operatives - 50 000 copies left in business.

3 – A DATABASE “CIMAROUT” AVAILABLE ON THE INTERNET

A website is now available for members of the USIRF (Union of French road industry) and for its partners in the Ministry of Health and in the Ministry of Labor, the CNAM-TS and the Occupational Medicine. This website is called CIMAROUT, (i.e. information center of road materials). Currently, only bitumen is concerned, but then will let available, and continuously updated, all the knowledge of hygiene and health requirements for all materials used on construction sites.

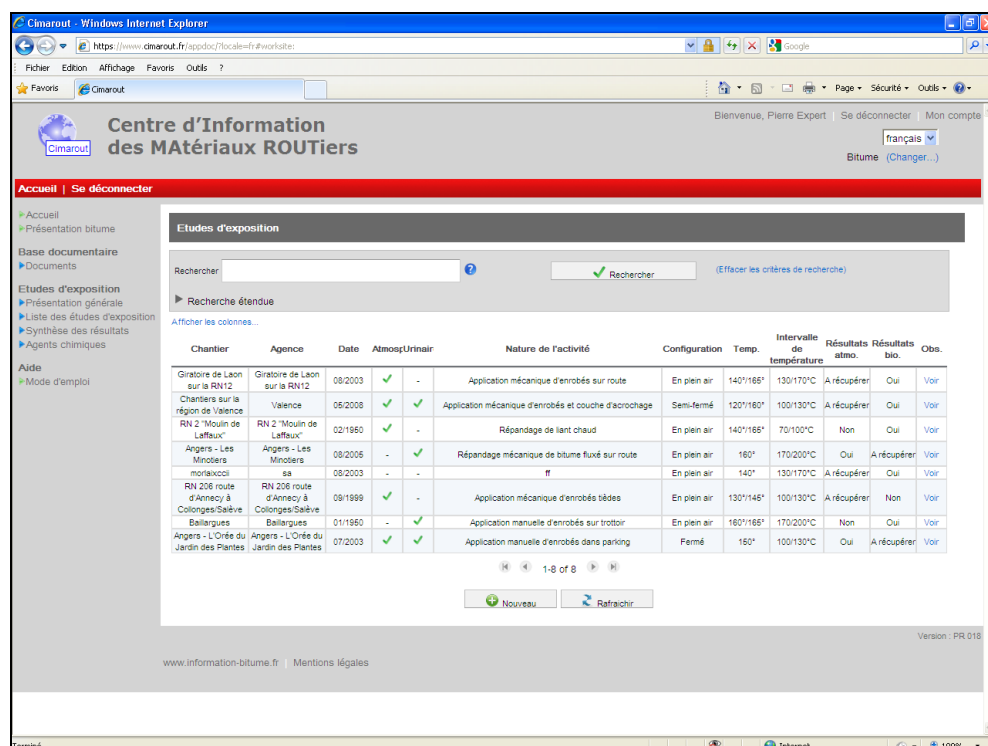
This website is currently in French but it will also soon be available in English.



It comes in two parts:

- 1 – A document database consisting of all studies published in French and international journals on the asphalt. It contains a list of toxicological studies, epidemiological having been published in international scientific journals. Each of these studies is listed with the summary and an abstract when it was published and the full text if it is freely available on the web.

In order to access to these various studies, it is necessary create a user account, and ask the site administrator for rights to access these databases.



2 – A database of all exposure measurements made on sites that either outdoors, in tunnels, in car parking during the implementation of various materials: hot mix asphalt, warm mix asphalt, emulsion tack coat, using different methods: motorway projects, implementing the finisher, implementation manual. 10 years of evaluations on sites were combined to share this information with all involved in prevention.

Accueil

Présentation

bitume

Base documentaire

Documents

Etudes d'exposition

Présentation générale

Liste des études d'exposition

Synthèse des résultats

Agents chimiques

Aide

Mode d'emploi

Terminé

Internet

100%

https://www.cinarout.fr/appdoc/?locale=fr#statement:

Fichier Edition Affichage Favoris Outils ?

Favorites Cinarout

Page Sécurité Outils

Centre d'Information des MATériaux ROUTiers

Bienvenue, Pierre Expert

Bitu

Accueil | Se déconnecter

Synthèse des résultats

Rechercher (Effacer les critères de recherche)

Filtre avancé

Afficher les familles...

RÉSULTATS

		HAP				Protocole INRS - LICO - Médecine du trav. - USIRF						Solvants			
		Anthracène	Naphtalène	Fluoranthène	Pyrène	Hydroxypyrene		Hydroxy BaP				Benzène	n-Hexane	Toluène	Styrène
						Début de poste	Fin de poste	Début de poste	Fin de poste	Début de poste	Fin de poste				
						µg/g créat	µg/g créat	µg/g créat	µg/m³	µg/m³	µg/m³	300 µg/m³			
Valeur objectif		150 µg/m³	0	mg											
Moyenne		35,38	64,25	-	-	31,00	50,05	-	28,00	-	-	-	146,88	6,00	32,25
Nombre de valeurs		4	4	-	-	2	3	-	1	-	-	-	4	1	2
Chantiers sur la région de la Vallée	moie	en	Régieur de finisseur	Pi	F										
	moie	en	Chauffeur du PATA	Pi	NF	45	≤45			98			124		12
RN 2 "Moulin de Laffaux"	moie	en	Chauffeur de la Hélandeuse	Pi	-	60	44			3	≤56				
	moie	en	Chauffeur du PATA	Pi	-		≤87			≤112					≤4
Angers - Les Minotiers	moie	en	Suiveur à pied	Pi	-		99			4	≤21	3,4			
	moie	en	Régieur de finisseur	Pi	-	25	165			98			≤654		32
Montaigle	fab	en	Manoeuvre à la fabrication	Pi	-										
RN 205 route d'Amézy à Colonges/Salève	moie	en	Chef de chantier	Pi	-		≤9						≤165		
	moie	en	Suiveur à pied	Pi	-					≤654				≤12	

This database created by and decided USIRF, has three objectives:

- improve knowledge of risks related to chemical agents by ranking exposure studies carried out in enterprises:
 - type of product used
 - type of activity
 - homogeneous group of exposure or the workplace
 - type of configuration
- help companies in their risk assessment, with the establishment of the "single document" and the implementation and monitoring of prevention and protection.
- Share the best practices.

It wants to be a tool:

- transparent to our partners in prevention.
- able of integrating new protocols.
- periodic exchange of data between the CNAM-TS, INRS, DGT, the GNMST-BTP, and OPPBTP USIRF.
- accessible with username and password.

In late 2000, USIRF is requested by the Occupational Medicine of Brittany to make an assessment of exposure to bitumen fumes. The USIRF agrees provided that the sampling and analysis are carried out following a precise protocol for seamless operation with other measures. INRS, the Interregional Laboratory of Chemistry of the West (CARSAT) and occupational medicine wrote the following protocol:

- atmospheric sampling and metrology

- solvent soluble fraction
- benzo (a) pyrene
- pyrene
- urine collection and biometrology
- 1-hydroxypyrene
- 3-hydroxybenzo (a) pyrene

Seven companies took part in this campaign of exposure assessment in summer 2001. All activities involved in bitumen fumes were followed:

- 11 sites
- mechanical laying of mastic asphalt (5)
- manual laying of hot mix asphalt (2)
- spreading of fluxed bitumen (2)
- spreading of bitumen emulsion (2)
- a binder plant

All workstations, potentially exposed to fumes, were taken into account.

Since 2002 ...

At the initiative of doctors from CARSAT, UHC, INRS, Interregional Laboratory of Chemistry and people from the Ministry of Labor, 22 other sites were evaluated and managed at the national level of the profession:

- 10 sites laying hot mix asphalt outdoor
- mechanical laying of hot mix asphalt (9 sites)
- manual laying of hot mix asphalt (1 site)
- 5 sites in more or less closed space (tunnel, underground car parks)
- 1 site spreading of hot binder
- 5 sites laying mastic asphalt
- a binder plant

At the initiative of road contractors,

11 other sites were evaluated and managed at the national level of the profession:

- 7 sites laying hot mix asphalt outdoor
- mechanical laying hot mix asphalt (5 sites)
- manual laying hot mix asphalt (2 sites)
- 2 sites spread of binders hot
- 1 site laying mastic asphalt
- a binder plant

20 workstations studied

766 measurements done on workers and on site

Early 2012:

70 sites have already been registered in the list of studies CIMAROUT.

The synthesis of the results is being finalized.

6 different types of products with bitumen are evaluated:

- HMA
- Warm mix asphalt
- Fluxed bitumen
- Emulsion bitumen
- Mastic asphalt
- Low-temperature mastic asphalt

8 different activities are evaluated:

- Mechanical laying of hot mix asphalt,
- Manual laying of hot mix asphalt,
- Manufacturing hot and warm mixes,
- Spreading of fluxed bitumen,
- Spreading tack coat emulsion,
- Manufacturing bituminous binders,
- Laying mastic asphalt,
- Manufacturing mastic asphalt,

9 families of workstations are assessed with individual samples:

- Finisher's operator,
- Finisher's screed man,
- Machine operator,
- Raker
- Asphalt foreman,
- Operator spray bar,
- Operator laying mastic asphalt,
- Operator in mastic asphalt plant,
- Witness

and background samples at fixed points.

More than 40 chemicals grouped into seven different sorts of measurement protocols:

- Protocol INRS - CARSAT - Occupational Medicine – USIRF
- Polycyclic Aromatic Hydrocarbons (PAHs)
- Aromatic hydrocarbons - petroleum solvents
- Cn Hm hydrocarbons - oil cuts
- Diesel particles
- Other chemicals
- Other protocols

The protocol INRS - Occupational Medicine - CARSAT - USIRF validated in 2001

- Atmospheric sampling
 - Pyrene
 - Benzo (a) pyrene
 - Inhalable dust
 - Fumes
 - Solvent soluble fraction
- Biological monitoring
 - 1-hydroxypyrene
 - 3-hydroxybenzo (a) pyrene

Polycyclic Aromatic Hydrocarbons particulate and gaseous PAH-

- Atmospheric sampling
 - Naphthalene, anthracene(g), fluoranthene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, indeno(1,2,3,c,d)pyrene, benzo(ghi)perylene,
 - Gaseous and volatile PAH
 - Amount of particulate PAH
 - Sum of carcinogenic PAH
- Biological monitoring
 - 1 & 2 naphthols

Aromatic hydrocarbons - petroleum solvents

- Atmospheric sampling
 - benzene
 - cyclopentane
 - n-hexane

- toluen
- styrene
- xylene
- ethylbenzen

Cn Hm hydrocarbons - oil cuts

- Atmospheric sampling
 - C5-C7, C7-C8, C8-C9, C9-C10, C10-C11, C11-C12 and C12-C14, C6-C12 all vapors
 - C8-C17 nonaromatic fraction
 - C8-C17 aromatic fraction
 - C7-C17 nonaromatic + C9-C16 aromatic

Diesel particles

- Atmospheric sampling
 - Organic carbon (OC)
 - Elemental carbon (EC)
 - Total carbon

Other chemicals

- Atmospheric sampling
 - Formaldehyde
 - Acetaldehyde
 - Carbon monoxide

Other protocols

- TOC (Total Organic Compounds)
- Others?

Methods taking into account the detection limit values

- If a value is below the limit of detection (<LOD), the value taken into account in the calculations is:
 - equal to 1/10th of the smallest of the measured values (calculation method No. 1 used in the database "COLCHIC")
 - equal to half the detection limit (calculation method 2)
- The method chosen applies to all the calculations of the database.
- For example, extractions following CIMAROUT are made with two methods:

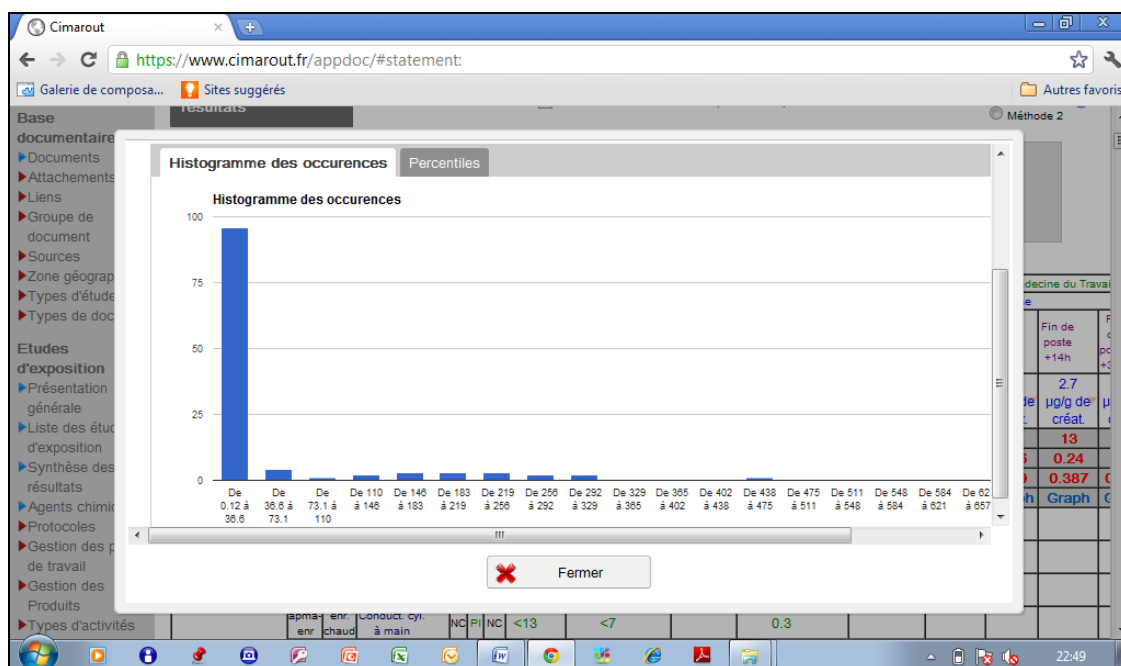
TABLE OF MEASUREMENTS RESULTS

Cinmarout

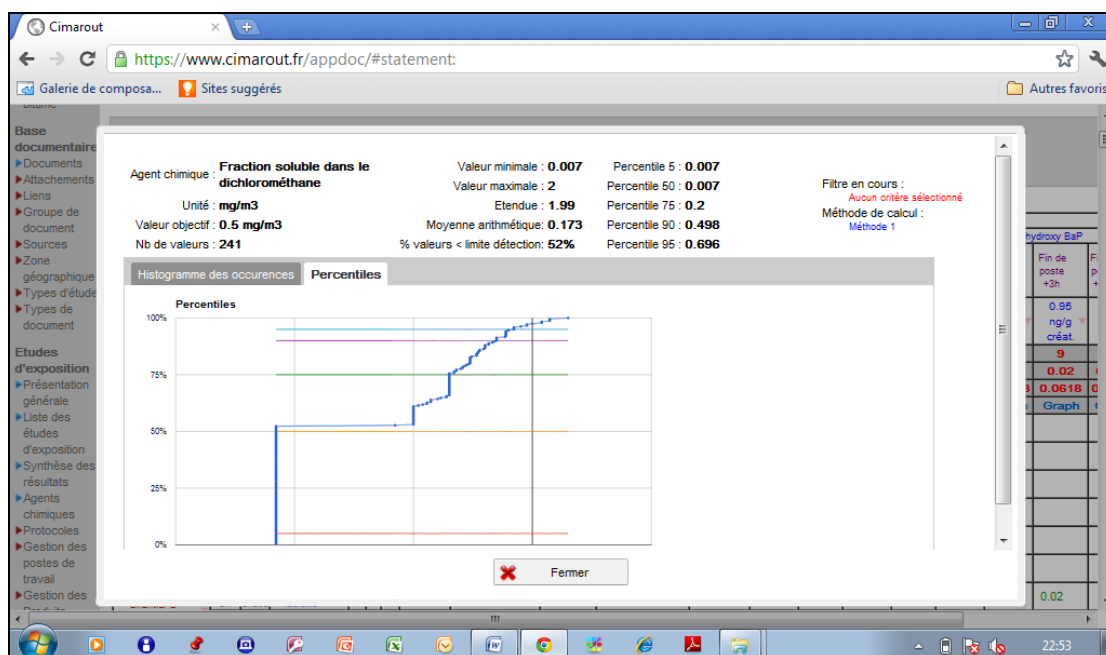
Internet Explorer

https://www.cinmarout.fr/appdoc/Token.html#statamark

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CALCULATION WITH METHOD 1



CALCULATION WITH METHOD 2

The database allows the calculation of a mean and a standard deviation, with curves and histograms to verify the number of occurrences of high exposure values and to indicate the cause (product used fluxed bitumen containing oils such as coal tar).

4 – USING CIMAROUT ON IMPROVING PREVENTION:

a- Evolution of metrology for exposure to asphalt

With all data set in CIMAROUT, we can now study a new method to measure the inhalation exposure, defined and accepted by all. The INRS is currently working on a comparison of methods identified in the literature to evaluate the performance of these methods and to propose and validate a single protocol. Once the first phase of laboratory validation is completed, a field validation is necessary.

We can also start an ergonomic study on the detection and identification of situations or procedures that determine skin exposure to asphalt. This study will provide clues to methods of evaluation of dermal exposure or surface contamination. This study will be done in collaboration with companies in conjunction with USIRF.

b. Evolution of finishers and fume extraction

The USIRF confirmed the willingness of the profession to continue to work on testing fume extraction on the finishers.

All data included in CIMAROUT and measurement of occupational exposure near finishers is going to allow efficient fume extraction system to be set on the machines.

c. Reuse RAP (recycling asphalt pavement)

Deconstruction operations such as road upgrading should take into account the characteristics of the products to the extent of risk materials or pollutants could be incorporated or may be still present.

Characterization can be made necessary. Where it is found in the presence of materials at risk, as the Client that the company must comply with general principles of prevention and apply the appropriate regulatory framework.

This comprises the following phases of work: laboratory milling (planning), sawing, transport, put into storage, retrieval, production, implementation.

We also have to consider recycling hot or cold mix, reprocessing in place with or without asphalt. The risks to be considered: silica, asbestos, tar.

We must be able to meet the gap between the different actors involved and especially the owners and contractors, compensate for the lack of common methodology or reference incorporating aspects of health, encourage a coherent approach to prevention at the regional level (initiatives are increasing the level of Occupational Health, and Inspections of CARSAT Labor without contact).

Step 1: Characterization

The objective is to provide technical recommendations, methodological and prevention for characterizing pavement planning and deconstruct. These recommendations are primarily intended for owners of pavements or roads and but should be brought to the attention of all stakeholders: owners, contractors, safety coordinators, businesses, regulators safety and health work and prevention.

It is the owner, owner of the infrastructure, to ensure, during the project design, the possible presence of asbestos and tar in the book before launching the consultation, either through its archives or by making analysis.

Step 2 : Mix-design and manufacturing

The objective is, from the draft safety data sheet on the hot mix asphalt under discussion within the USIRF to finalize this MSDS and stop the principles of its implementation by detailing how of implementation.

Step 3: Working on road or floor, (including removal) Handling, Transport, Storage and Implementation recommendations

The objective is to provide methodological recommendations for prevention and "frame" the implementation of road recycled products as close as concerns "health", like sheets made by the DGT of interventions on roadways with asbestos.

d. Mastic asphalt

The USIRF and the Asphalt Office intend to rely on a state of the art on the conditions of implementation of the asphalt under the general terms of prevention and the results available exposure studies conducted by employees of companies in collaboration with the network or CARSAT.

The database CIMAROUT may be used for new protocols, and will thus allow new exposure studies. Recommendations may be provided to reinforce or improve the conditions of laying mastic asphalt and be brought to the attention of stakeholders in business, network CARSAT, labor inspectors and owners.

5 – CONCLUSIONS

Using this new website will enable a better understanding of the exposure of workers working at different locations on construction sites. A better understanding of exposure, workstation by workstation, according to the different types of sites, the different types of materials containing bitumen, thanks to all the measurement campaigns will improve prevention on sites not only with mix design and selection of the right temperature for the laying of these materials, but also with implementing new organization of the various tasks on construction sites.

CIMAROUT will become an indispensable tool for prevention professionals in contractors companies but also for all those who regularly check sites: occupational physicians, labor inspectors, officers of CARSAT...
