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Department of Transport

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County and City Management Association

LASNTG
Local Authority Services National Training Group

LOCAL AUTHORITY ROADS CONFERENCE and EXHIBITION - 2022

How Road Maintenance can contribute to sustainability

Jim Campbell
Senior Engineer
Colas Ireland

- How to maintain our road network to an acceptable level while reducing carbon and energy inputs
- Our road network is an essential asset to the state and represents a very significant investment for our country
- If it is not properly maintained it will degrade at huge economic and environmental cost
- The need is to identify techniques to reduce Carbon generation and energy inputs while not compromising the pavement.

The Irish Road Network-
100,112 km of public roads

Roads in Ireland	Length (km)	% Surface Dressed
National Roads		
Motorway	**916**	**0**
National Primary & Secondary	**4390**	**25%**
Non National Roads		
Regional	**13162**	75%
Primary County	**24177**	82%
Secondary County	**33404**	86%
Tertiary County	**24063**	93%

Dealing with Climate Change is a complex problem.
I am suggesting using available methods to reduce Carbon emissions in Road maintenance

- Using low resource treatments to prolong pavement life removing the necessity for resource intensive interventions

- Use low Energy pavement materials and methods where pavements need renewal or replacement, These include the use of
- Recycling
- Cold and Warm mix asphalt rather than Hot mix
- Use of RAP (Repurposed Asphalt Products)

Drainage

Three things water should not do

Get in from the side

Get in from the joints

Find its way between unbonded layers

Three things to remember about drainage

It is essential

It needs to be continuous

It needs to be maintained

TRL Road note 42 Best Practice Guide for Durability of Asphalt Pavements

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Effective Road drainage is the most significant contributor to pavement life

- Locate and record all drainage assets
- Implement a programme of inspection and maintenance
- Inspect roads on a wet day to identify problem locations

Repair minor defects before they become major defects

Surface Dressing

- Consider using smaller chipping sizes on low trafficked roads
- 2/6mm chippings on local secondary and tertiary roads
- 57% of network
- Immediate savings of 30% in materials and energy usage

Pavement Retexturing

High Velocity Impact Shot Blast Providing Microtexture improvement on polished HRA

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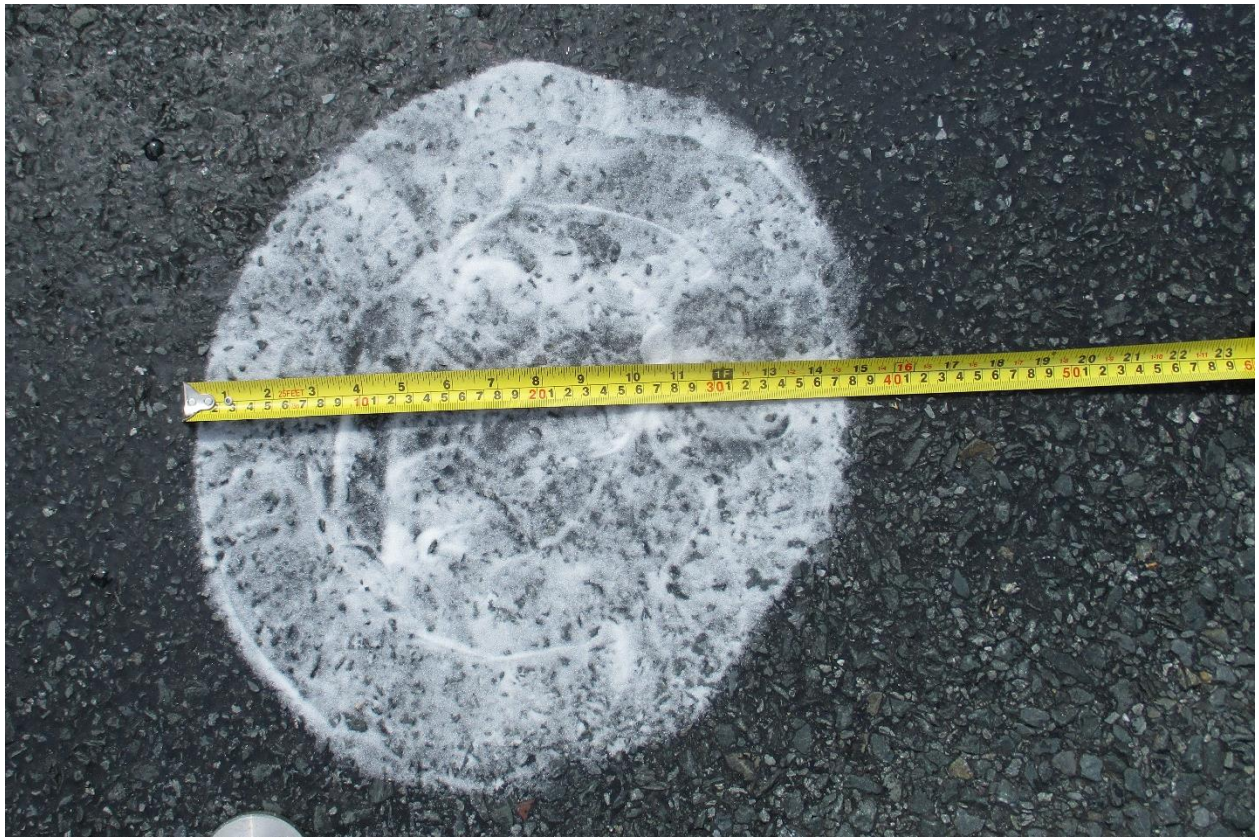
Pavement Retexturing

Macrotexture 0.43mm



Macrotexture 1.86mm After retexturing using ultra high pressure waterjetting

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Water Ingress at Joint

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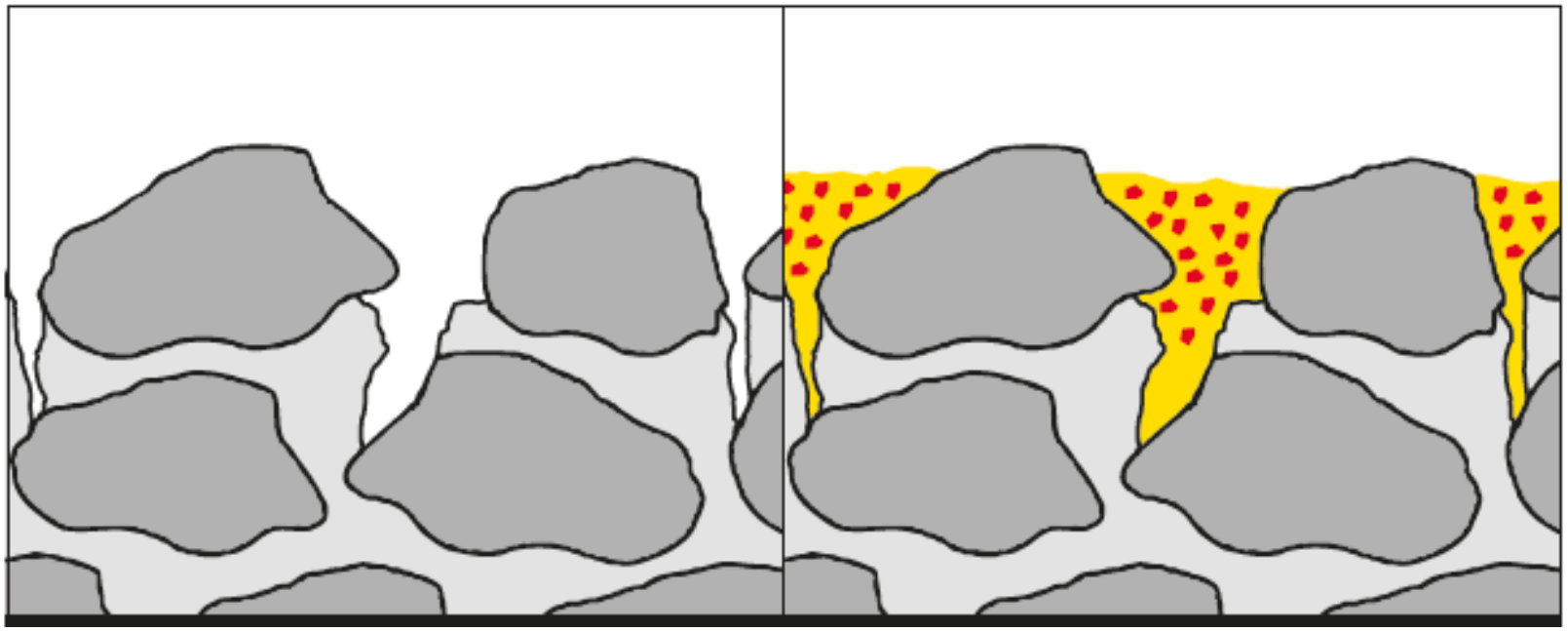
TII publication AM-PAV-06059 Crack Sealing & Joint Repair Systems

Pavement Rejuvenation



Yellow parts in the illustration are the added binder.

Red dots represent the fine aggregate.

The combined result adds asphalt mortar and restores the microstructure of the surface.

Pavement Rejuvenation

- *Binder aging occurs:*
  - *During storage of the bitumen at high temperatures;*
  - *During mixing at high temperature at the hot-mix plant; and*
  - *During the service life of the asphalt mix.*
- *Binder aging is:*
  - *Loss of some of the oil fraction in the bitumen;*
  - *Oxidation of the bitumen (during mixing and in service);*
  - *UV radiation at the surface of the mix.*
- *Causes the binder to harden and become brittle and eventually to fail to function.*
- *Chip loss can occur at the surface of the pavement.*

Pavement Rejuvenation

- *Bituminous binder containing a "rejuvenating" oil to halt/reverse this ageing process.*
- *Rejuvenating binder is applied to the pavement surface, before it gets too old.*
- *It penetrates into the existing asphalt to soften the aged binder and to add new fresh binder to the surface*

➡ **The life of the pavement can be extended by up to 6 years!**

A saving of 30 tonnes of CO_2 eq. per km of pavement treated

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In-Situ Pavement Recycling

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What is (hot-mix) asphalt?

- Bitumen is heated to 160 °C
- Aggregate is heated to 180 to 190 °C

Over time, the bitumen ages and hardens

- It gets brittle and stops acting like a glue
- The pavement will ravel/fret

WARM-MIX ASPHALT

- *Warm-mix asphalt technologies developed in mid 00's;*
  - *Wax additives (ΔT = -35 ℃)*
  - *Foamed bitumen (ΔT = -15 ℃)*
  - *Chemical surfactants (ΔT = -35 ℃)*

- *Over 7 millions tonnes of warm-mix asphalt paved worldwide*

  ➢ *A tried and tested technology*

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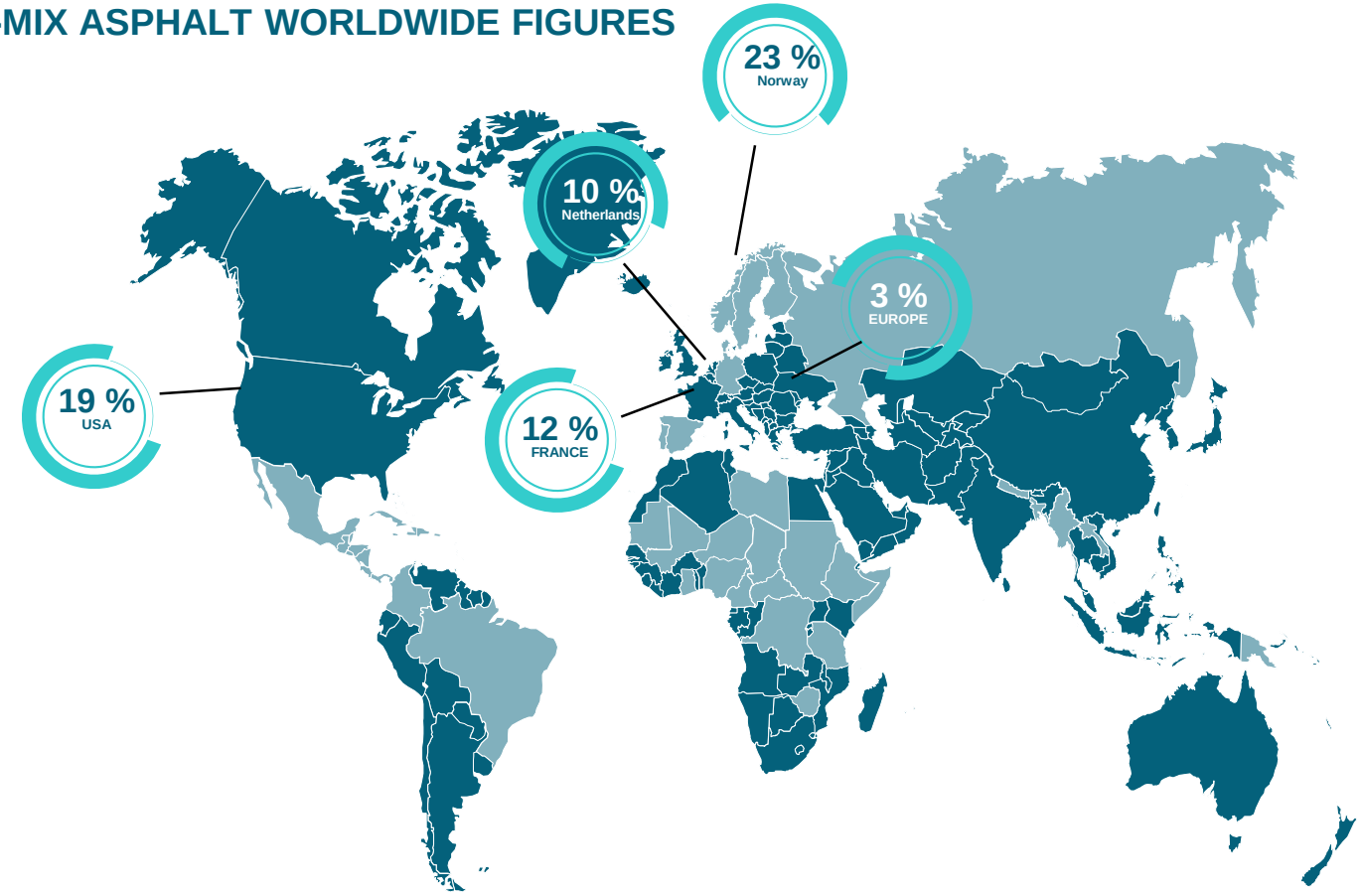
WARM-MIX ASPHALT WORLDWIDE FIGURES



Figures taken from EAPA report "Asphalt in Figures 2019":

- Warm Mix Asphalt is defined as mixtures produced by using special techniques and/or additives to reduce the production temperature.
- The production temperature is between 100 and 150 °C

WARM-MIX ASPHALT

Can be used on all bitumen types:

- Pen grades;
- PMBS;
- Hard grades;

Can be used with all types of asphalts:

- Asphalt Concrete
- SMA
- HRA
- Marshall Asphalt
- Porous Asphalt
- Mastic Asphalt
- Mixes containing RAP

Can be used on all traffic levels

Laying warm-mix AC 20 binder course in Co. Galway in 2010

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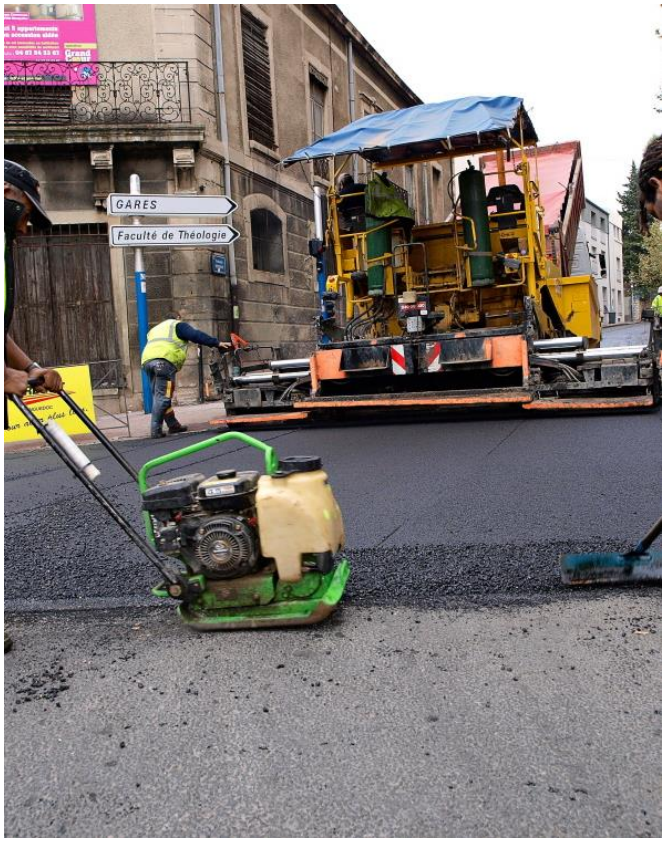
WARM-MIX ASPHALT

- *Warm-mix asphalt enable mixing temperatures to be reduced by 35℃;*
- *An 80 % reduction in VOCs at the job-site!*
- *Fuel use at the mixing plant is reduced by 15 to 20 %;*

A saving of 16 tonnes of CO_2 eq. per km of pavement constructed *

**** for the 22 cm of asphalt layers on a 7 m wide pavement***

- *Carbon footprint for the 2 million tonnes of hot-mix asphalt used in Ireland is 94,000 tonnes of CO_2 eq. per annum;*
- *A reduction of over 10,000 tonnes of carbon can be achieved, per annum*



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COLD-MIX ASPHALT

- **What is cold-mix asphalt?**
  - Cold process
  - Bitumen emulsion binder
    - does not require aggregates to be heated
  - Softer residual binder
  - Less binder ageing
  - More flexible mix
  - Less fatigue cracking

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COLD-MIX ASPHALT

- A proven technology
- Reduces your carbon footprint by up to 18 %.

A saving of 14 tonnes of CO_2 eq. per km of pavement constructed *

(* if we substitute a 120 mm thick AC 32 base course hot-mix with a 120 mm thick grave-émulsion cold-mix)

COLD-MIX MICRO-SURFACING

- **Reduces your carbon footprint by at least 50 %.**

A saving of 15 tonnes of CO_2 eq. per km of pavement constructed *

(* if we substitute a 35 mm thick SMA 10 hot-mix with a micro-surfacing)

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Storage of Processed Reclaimed Asphalt

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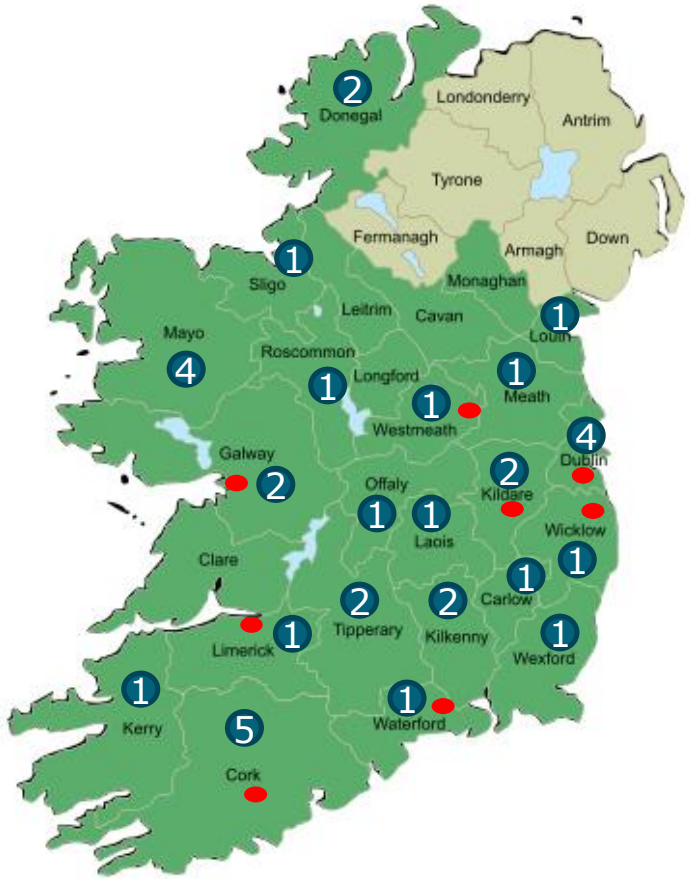
Asphalt plants in Ireland



- 42 plants
- 17 plants with Re-use facility

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Best use of RA is back into the Hot-Mix Asphalt

- **RAP is 100% Re-useable**
  - Only Re-use in new asphalt mixes can capture the full Environmental and Economic value of RAP by replacing limited, diminishing and expensive natural resources (aggregate and asphalt)
  - Energy savings derived from RAP Re-use
  - Reduced movement of raw materials
  - Sustainability - reduced carbon footprint
  - Reduction in green house gas emissions
  - Improved LCA / EPD

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Thank You

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