

INNOVATIVE PAVEMENT PRODUCTS REVIEW



JULY 2024 – MICHAEL ESENWA



Michael Esenwa

Manager,
Design and Engineering Services

We provide technical support
We formulate new and greener products
We train industry stakeholders
We push our industry to embrace decarbonization
We promote digitalization and AI

Innovation & Growth

Low Carbon Products and Processes
Innovative Product Offering
Technical Publications and Marketing
Digital Transformation and AI





SPECIAL PROJECTS

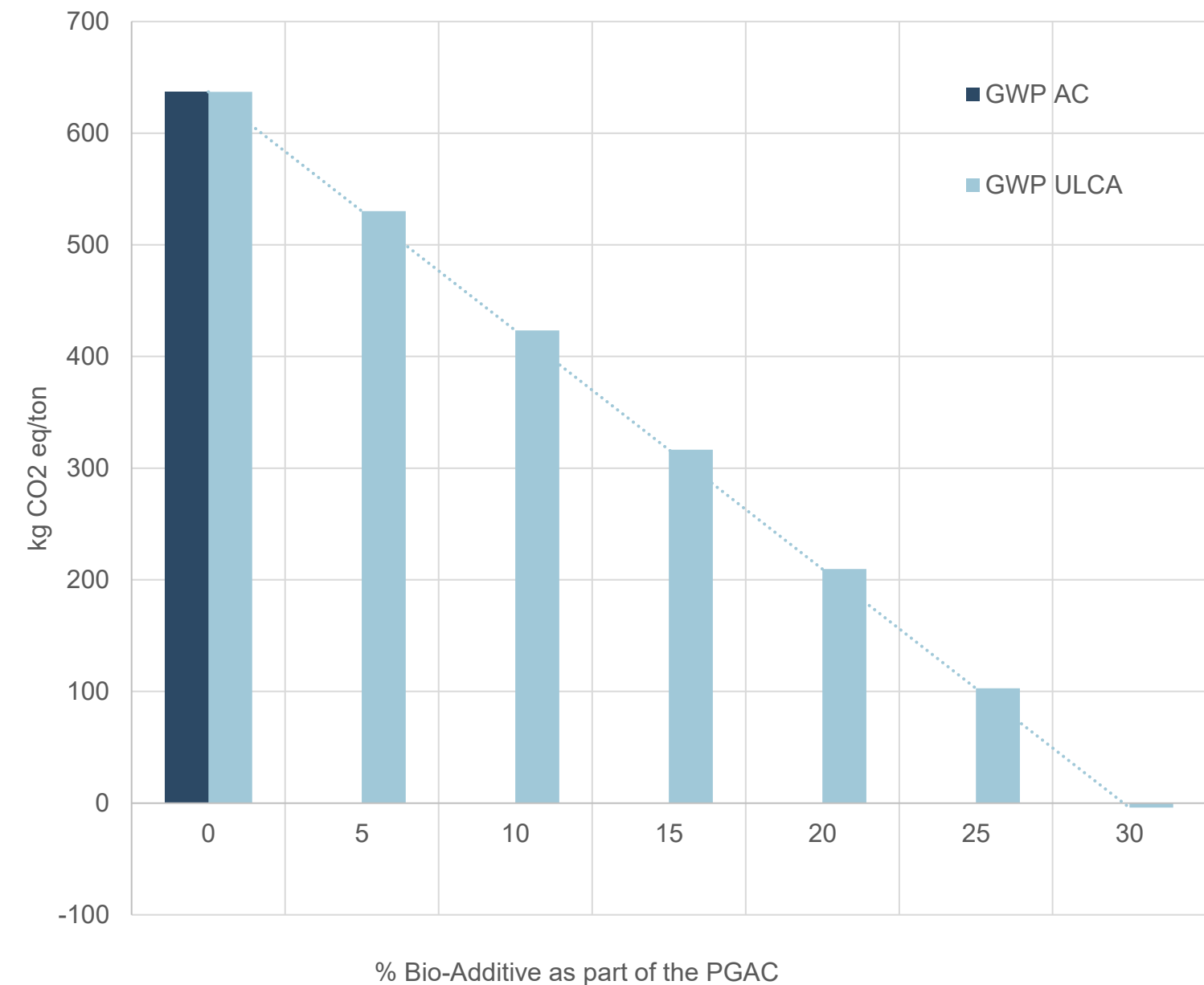
EVERLIFE ULCA®



EVERLIFE ULCA

- Concept: bio-components acting like a carbon sink lowers the overall AC GWP
- Overall properties and durability of AC cannot be compromised
- MCA has developed and tested a carbon-neutral PG 58-28 in 2022 and a PG 58H-34 PMA in 2023
- ULCA AC is a full drop-in into an existing specified HMA
- Field trials conducted in Canada Oct 2022 and June 2023, Quebec

Effect of Bio-Components Dosage on GWP



ULCA PG 58H-34



PG 58H-34

ULCA 58H-34

CONTROL
ESG-10

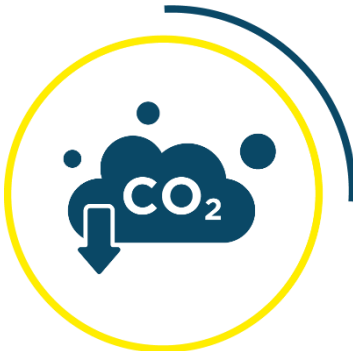
ULCA ESG-10

GWP (kg CO₂/t)
725

GWP (kg CO₂/t)
391

GWP (kg CO₂/t)
58.3

GWP (kg CO₂/t)
40.3



-46%



-31%

EVERLIFE RECYCLE[®]



EVERLIFE RECYCLE[®]

Trials programmed in AB & SK for 2024

Field evaluations of the existing QC trials – spring 2024

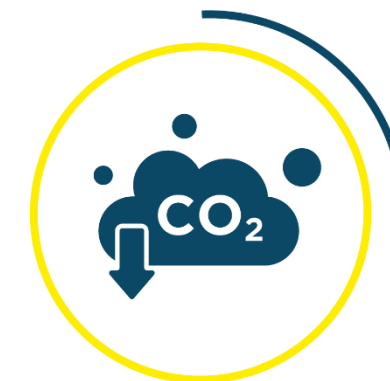
QC RAP situation persists; might transition to dense graded cold mix for 2024 (Easycold)

Technical discussions with France, Scandinavia on RAP cold mixes best practices; limitations (Valorcol)

EVERLIFE RECYCLE

GWP (kg CO₂/t)

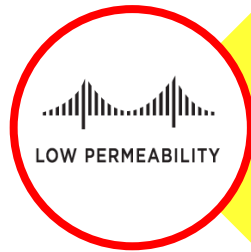
~8



OTHER EVERLIFE PROCESSES



EVERLIFE PROCESSES



Everlife LP® on NBDOT bridges – 15+ in 2024
Upcoming bridges in PEI, BC



Everlife Flex® back on in QC – Spring 2024
BC 5-year evaluation is excellent



Everlife UT® continued growth in ON
Marketing effort ongoing in SK



YVR planned project in 2024



- 30-40% GWP



HMA milling not required



- 10-25% GWP

SPECIALTY MIX

OTHER LOW CARBON AND INNOVATIVE PROCESSES



FACT OG

Open-Graded Cold Mix using newly developed emulsion

Emulsion formulation prevents runoff and allows the mix to be stockpilable

Plant trial (MCA) and field trial (Miller) in Oct 2023

In good position to win the first municipal contract

Product will be targeted for MTO if performing well



LOW-VOC COLD MIX

Developed to meet Quebec provincial specification

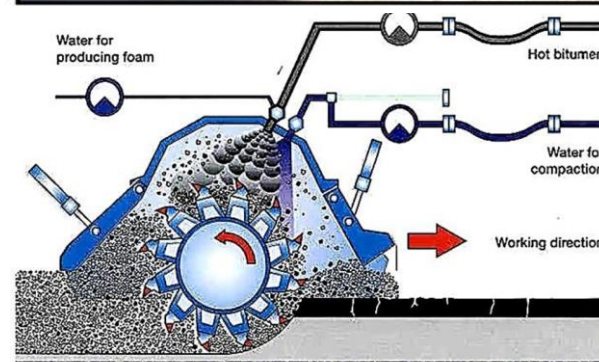
Utilizes a blend of bio and petroleum-based flux

Curing is a combination of evaporation and reaction with the oxygen from the air

2023 trial completed with Colas Quebec



Classification of Different Cold Mix Technologies in Canada



Regular CMA

Cold Recycling Mixture (CRM)

Cold-in-place Recycling (CIR)

Cold In-place Recycling with
Expanded Asphalt Mix (CIREAM)

Characterization of CMA in the Laboratory

- **Workability and Compactability**

- Assessing workability of cold patching materials, particularly at low temperatures, is critical for effective road repairs, with studies utilizing tests like the Blade Resistance Test (BRT) to quantify workability and understanding factors such as binder content and gradation's impact on workability and compactability



Fig 3. Blade resistance workability test apparatus [9]

- **Water absorption and loss**

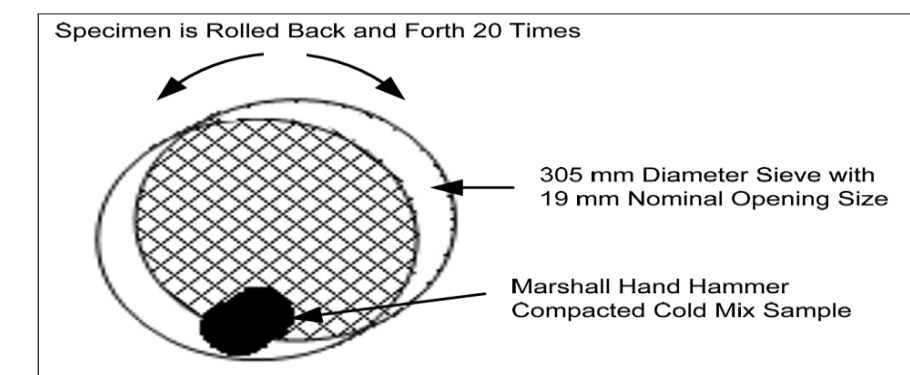
- Water absorption and loss testing are essential for evaluating asphalt mixture durability and performance, with standards in Quebec and Europe mandating calculations on different aggregate fractions to determine absorption values, revealing critical water content ranges regardless of compaction energy



Fig 4. Procedure of the adhesiveness test: (a) CMA compaction on top of HMA, (b) sample extrusion, (c) weighing the remnants after inverting the sample and measuring the separation time

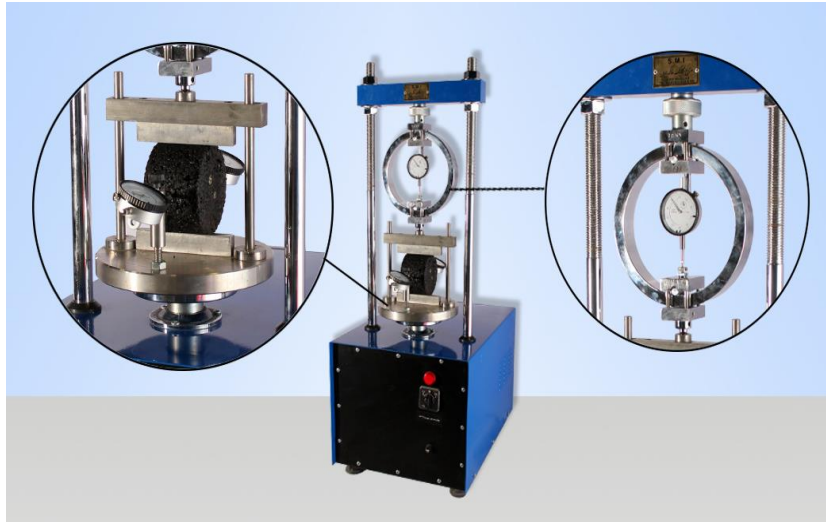
- **Cohesion and Adhesion**

- Cohesion, assessed via the rolling sieve method, varies across cold asphalt mixes, with higher cohesion observed at elevated temperatures, while adhesiveness, crucial for bonding, depends on asphalt binder and fines, with field evaluations necessary for validating performance



Rolling sieve method cohesion test

CMA Performance Test



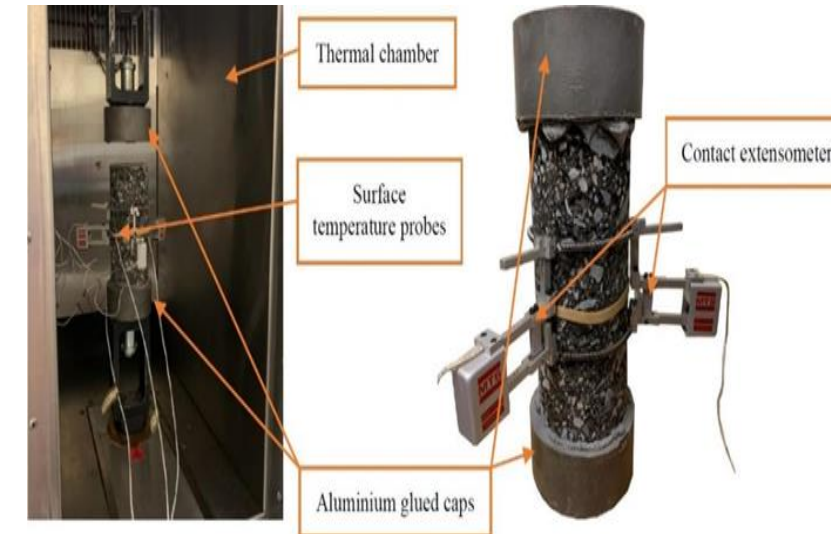
ITS test

The Indirect Tensile Strength (ITS) test evaluates asphalt mix durability, often with moisture and freeze-thaw conditioning, crucial for patching durability, while findings suggest a correlation between mix composition, moisture susceptibility, and stiffness evolution during curing



Rutting test

The Hamburg Wheel-Tracking (HWT) test, has been adapted to assess engineering properties and performance of CMA materials, despite its potential for premature specimen failure in CMA, with literature suggesting more than 10,000-wheel passes to adequately reveal moisture damage effects on asphalt mixtures



Fatigue performance

Bituminous materials' linear viscoelastic behavior is evaluated through cyclic TC tests across various temperatures and frequencies, while studies explore fatigue behavior in cold bituminous mixes using four-point beam testing apparatus, highlighting the influence of stabilizing agents like polymers and Portland cement on fatigue characteristics



Fracture resistance

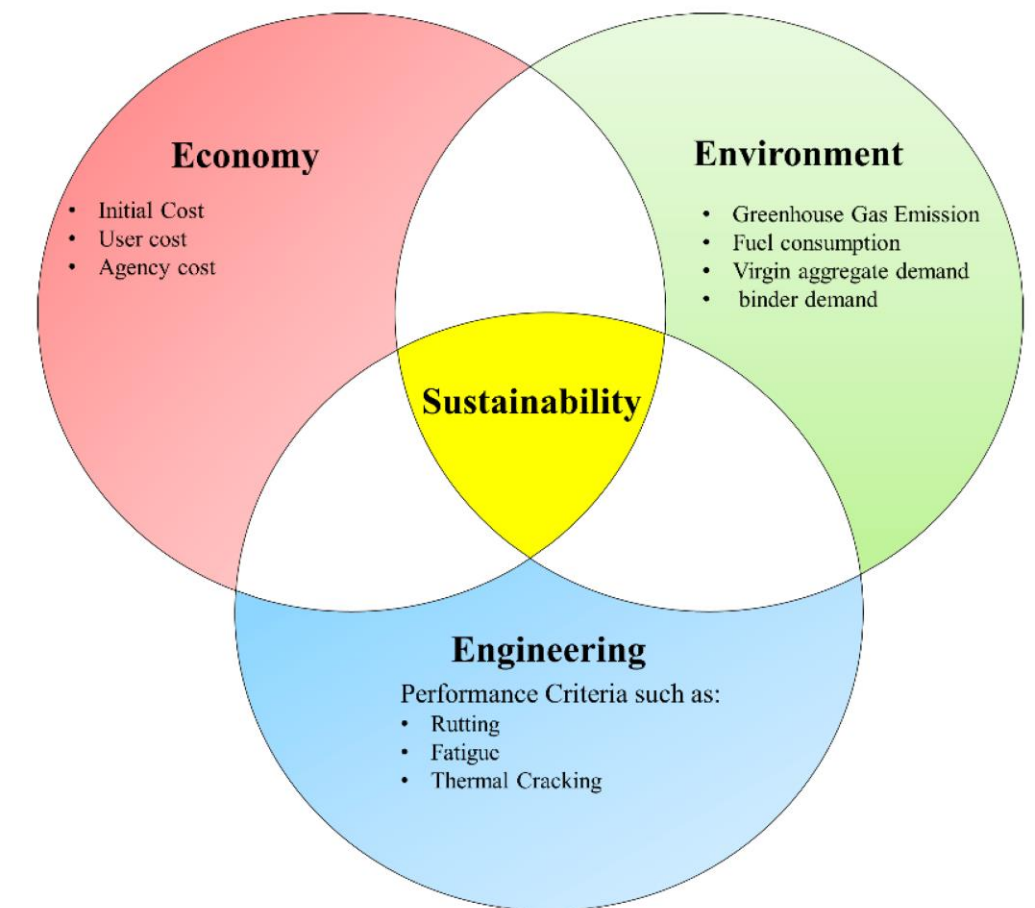
Research investigates methods to improve cold-recycled asphalt mix stiffness by modifying asphalt or adding additives like Portland cement, focusing on achieving adequate strength and bearing capacity, while the SCB test evaluates fracture behavior, indicating increased cracking resistance with higher cement content

Environmental Considerations

Emergence of new road pavement construction techniques focusing on environmental and economic considerations.

CRMs gaining prominence for structural layers due to producibility at ambient temperatures

Increased focus on pavement restoration interventions, with full-depth reclamation emerging as a cost-effective and sustainable technique, particularly in North America.



Sustainability assessment in different asphalt mixture



THANK YOU