

Caractérisation des matériaux recyclés à froid pour la réhabilitation des chaussées

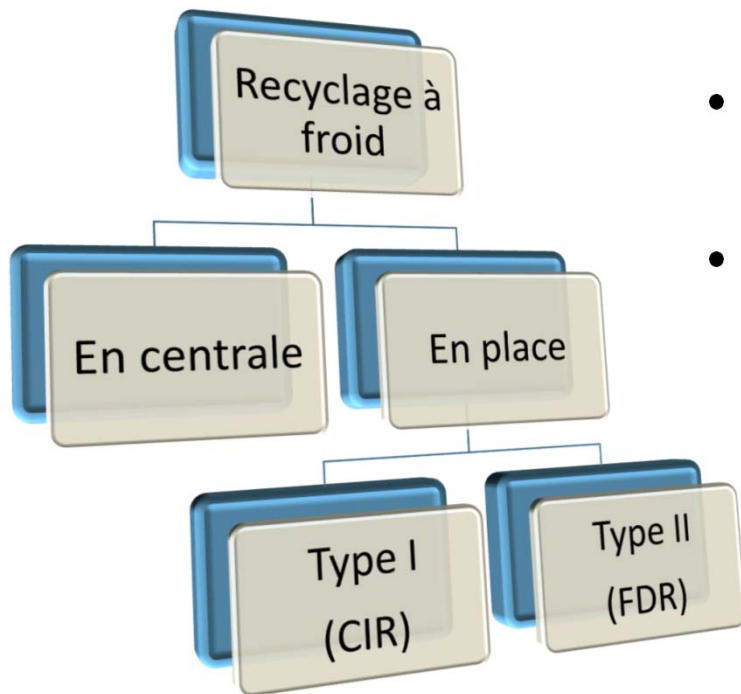
Alan Carter

École de technologie supérieure



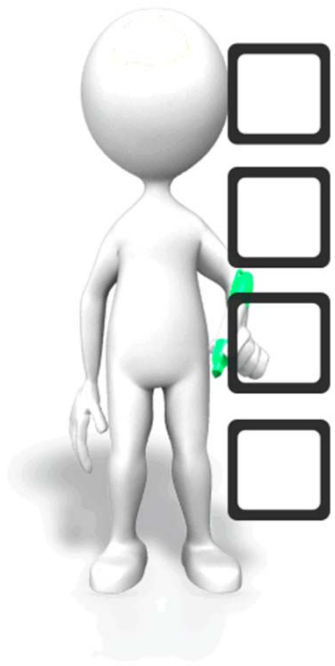
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Matériaux recyclés à froid



- Enrobés recyclés à froid
 - Cold Recycled Materials – CRM
- Doit séparer matériaux et techniques

Plan de la présentation



- Introduction
 - GBR
 - Enrobés recyclés à froid
- Caractérisation des enrobés recyclés à froid
 - On cherche à savoir quoi au juste?
 - Matériaux cohésifs ou granulaires?
- Caractérisation en laboratoire
- Caractérisation en place (sur site)
- Conclusion

Granulats bitumineux recyclés - GBR



- Reclaimed Asphalt Pavement – RAP
- Agrégats d'enrobés - AE



GBR



{ > 80 millions de tonnes utilisé en 2019¹
Tas accumulé en 2019 de 125 millions de tonnes¹



Tas accumulé de 4,3 millions de tonnes en 2018²



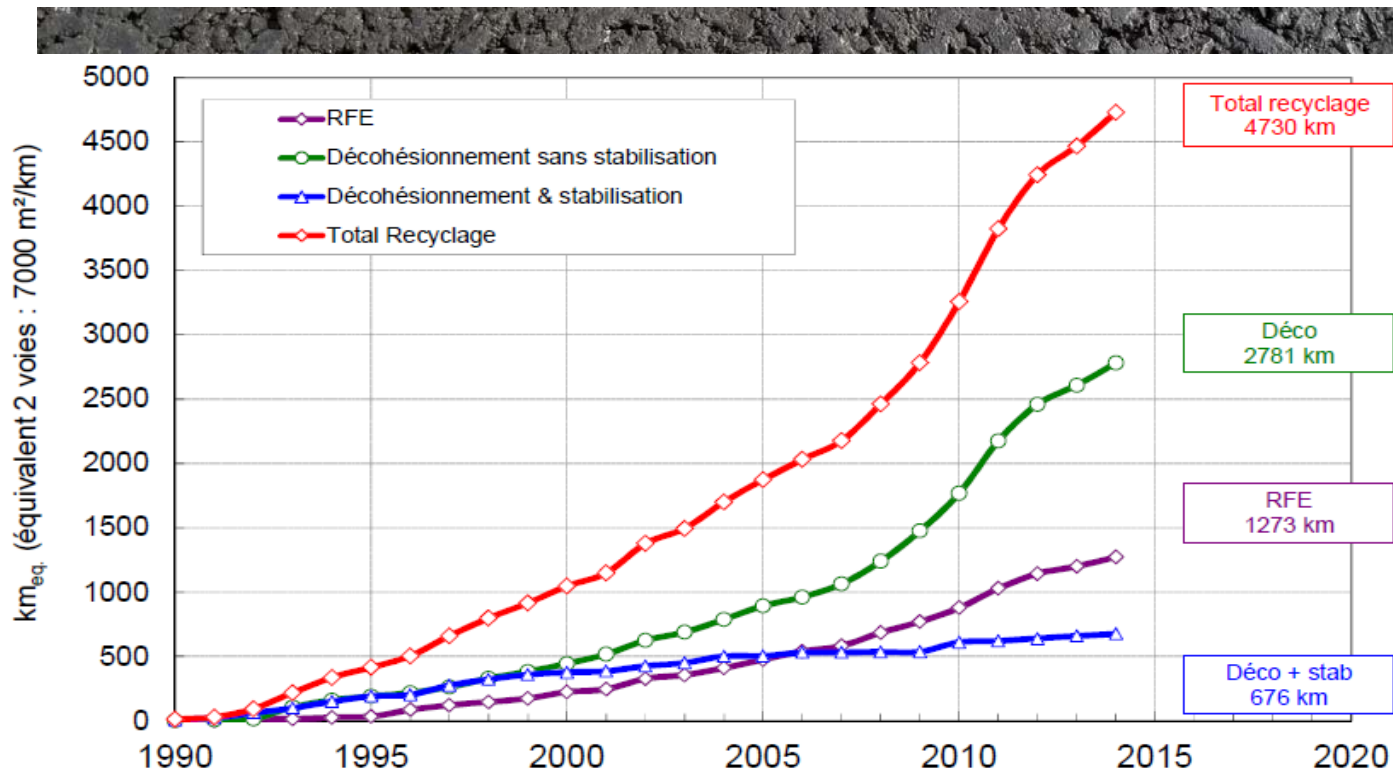
450 000 tonnes utilisés³

1 – NAPA, 2019

2 – Mneina et Smith, 2019

3 – BQ, 2010

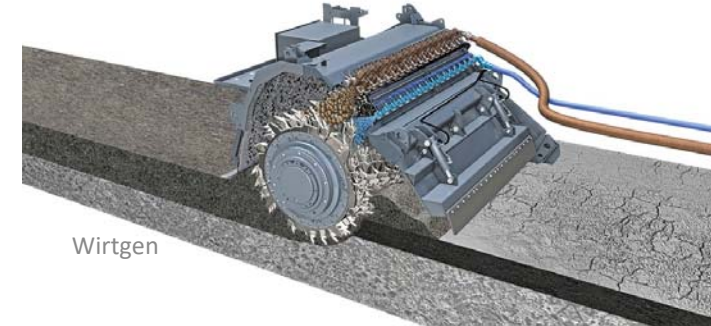
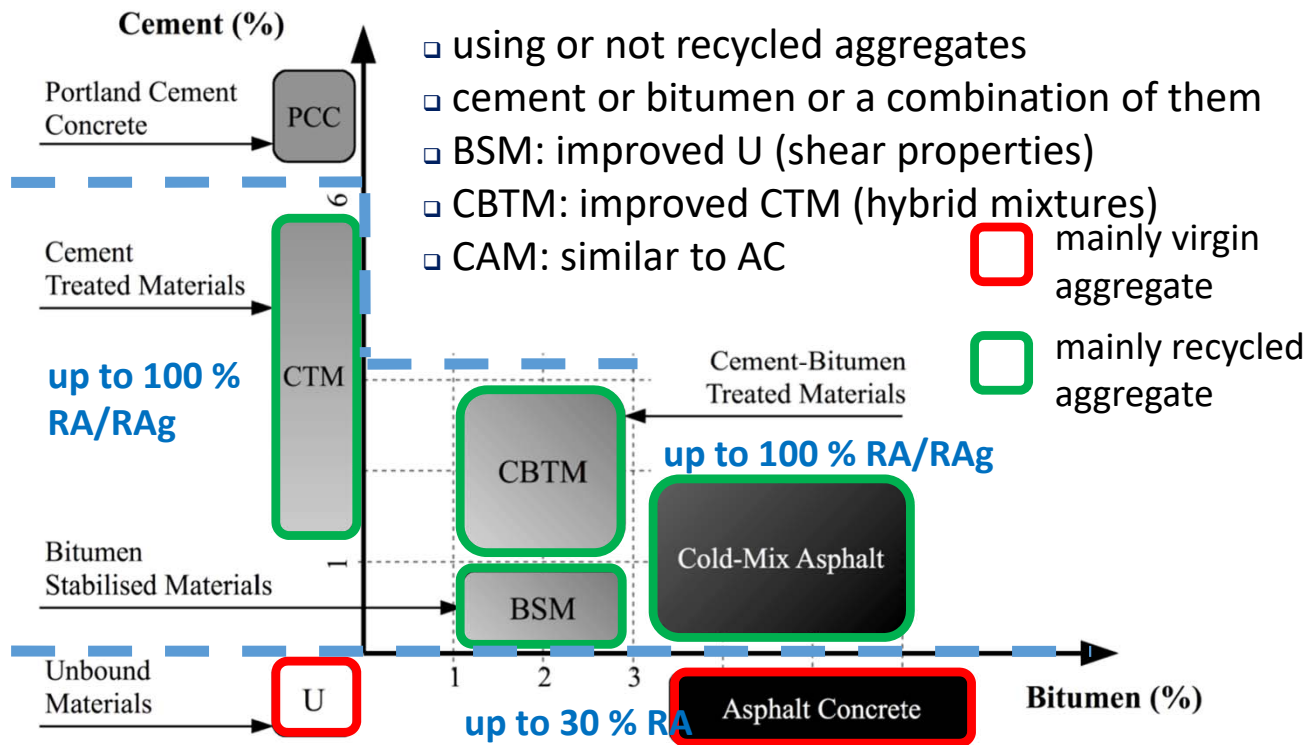
Recyclage à froid au Québec



MTQ

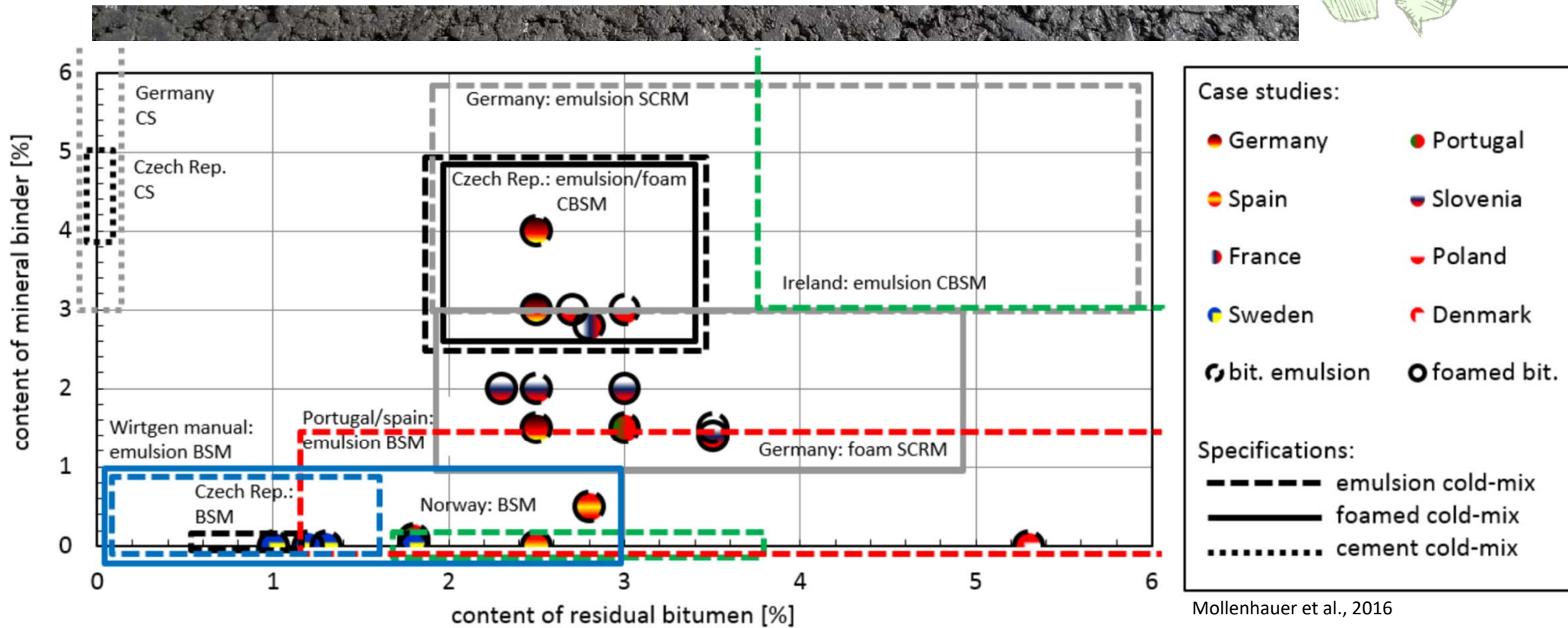
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Nomenclature

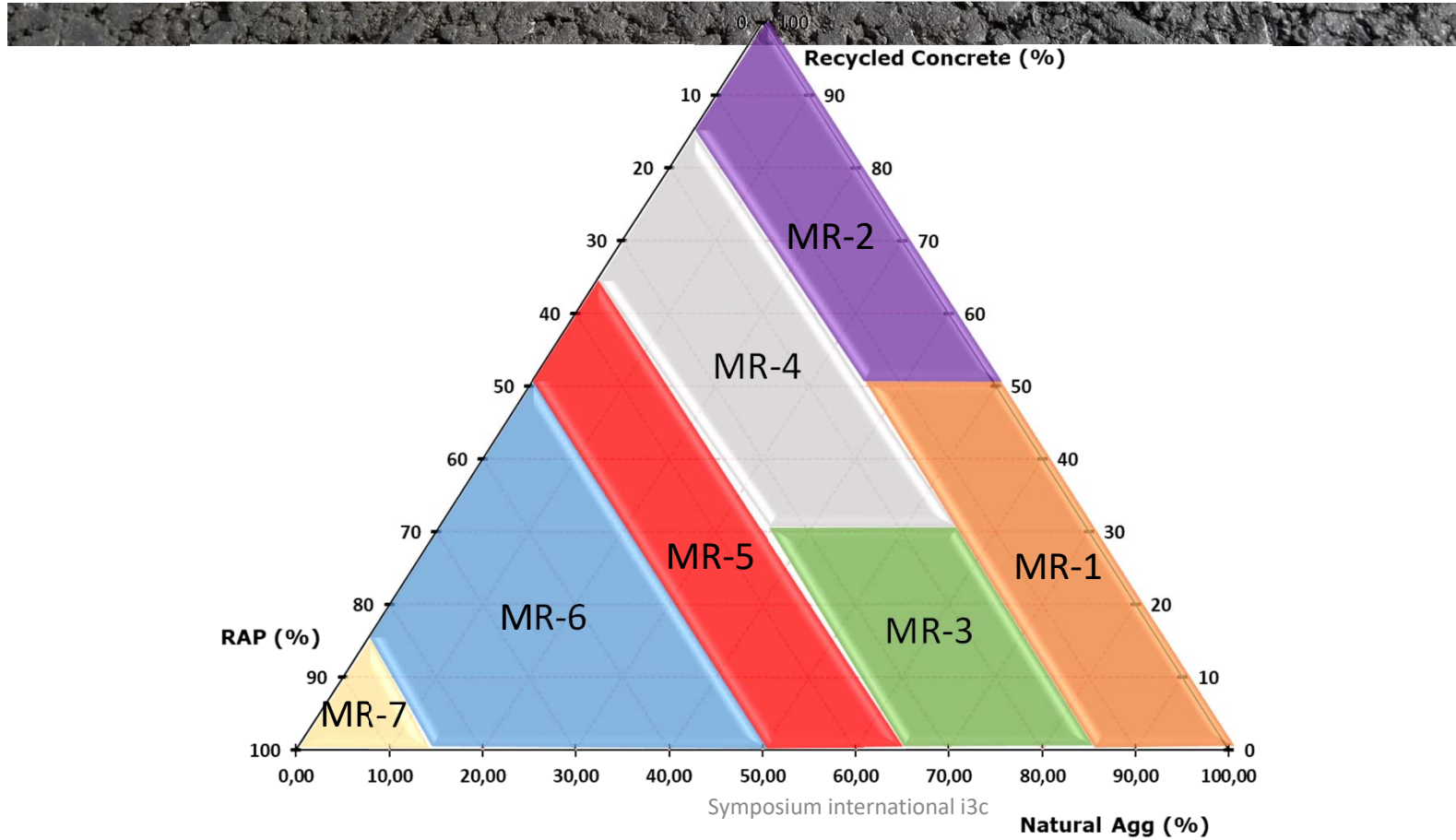


Wirtgen

Quantité de liant




Classification au Québec



On doit caractériser quoi au juste








- 
- Comportement thermomécanique
 - Performance
 - Orniérage
 - Fissuration par fatigue
 - Fissuration thermique


Enrobé moyen ou bien super granulat?



FOR PAVEMENT CONDITION **C** **D** **F** (PCI of 70 or less)

A cost-effective, long-lasting, greener alternative to conventional maintenance and rehabilitation techniques. Cold In-place recycling (CIR) is a process that cold mills and recycles the top 2-5 inches of asphalt using a continuous train operation. Through the complete reuse of existing material, CIR greatly reduces trucking, time and natural resources to significantly lower project costs. Generally, any road that is a candidate for mill & fill is a candidate for CIR.

-  20%–50% less expensive than conventional maintenance and reconstruction methods
-  Reduces greenhouse emissions by up to 90%
-  Reuses 100% of existing materials
-  20%–40% faster construction times
-  Adds 15–20 years (combined with appropriate wearing course)

 Most agencies use Structural Layer (a) Coefficients between 0.30–0.38 (Recent research indicates values from 0.36–0.44 may be more appropriate)

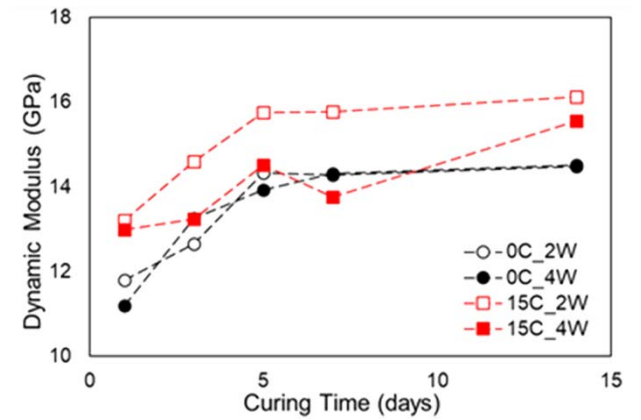
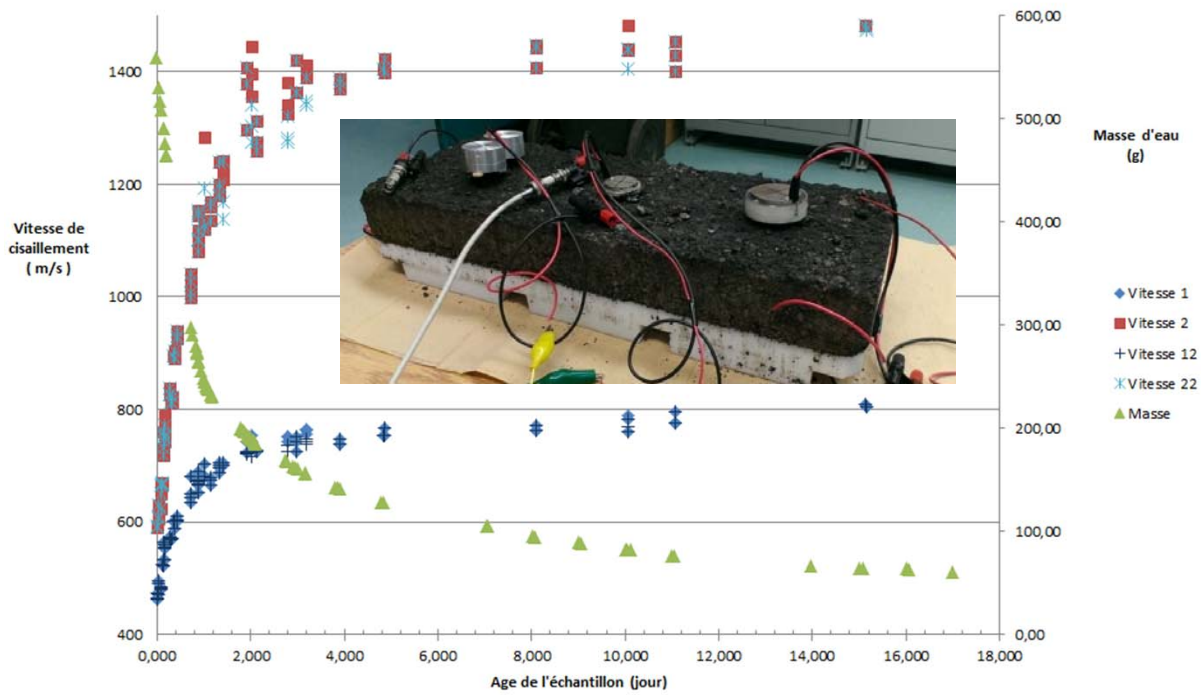
Issues Addressed

- Frequent, severe, non-load distresses in

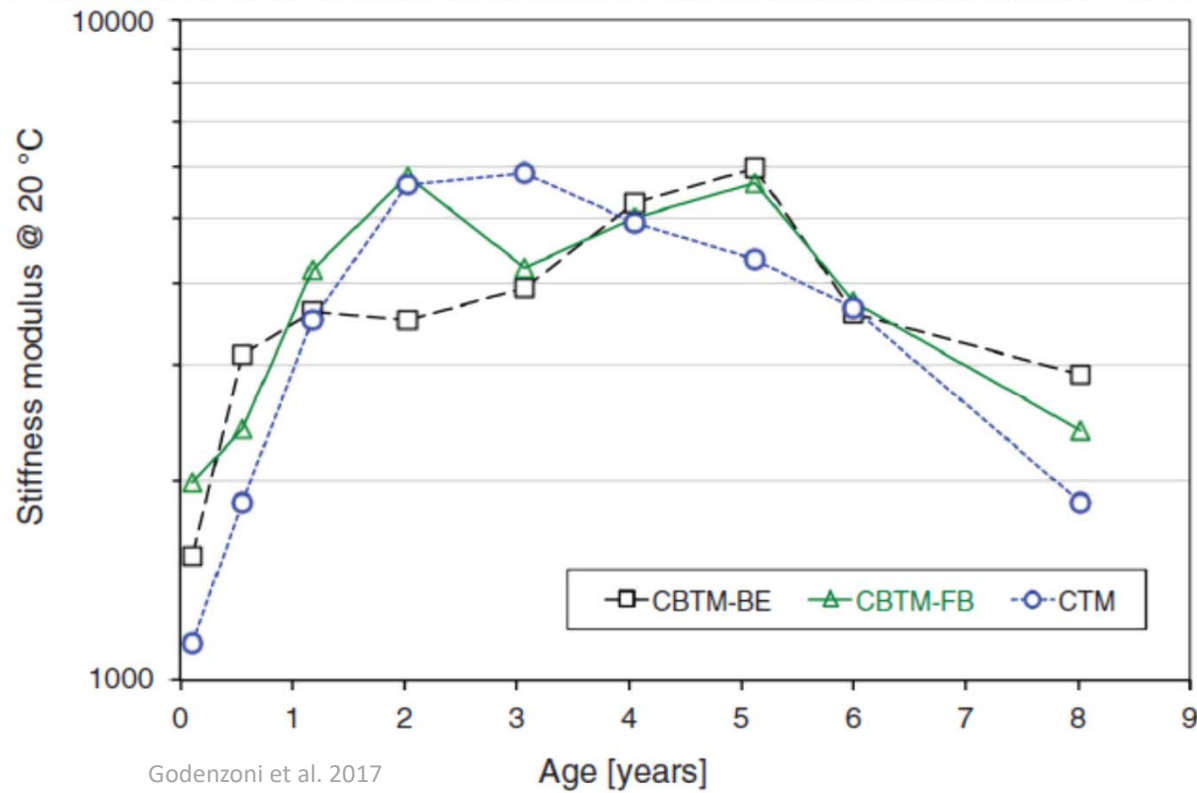
Attributes

- Eliminates defects within the recycling depth

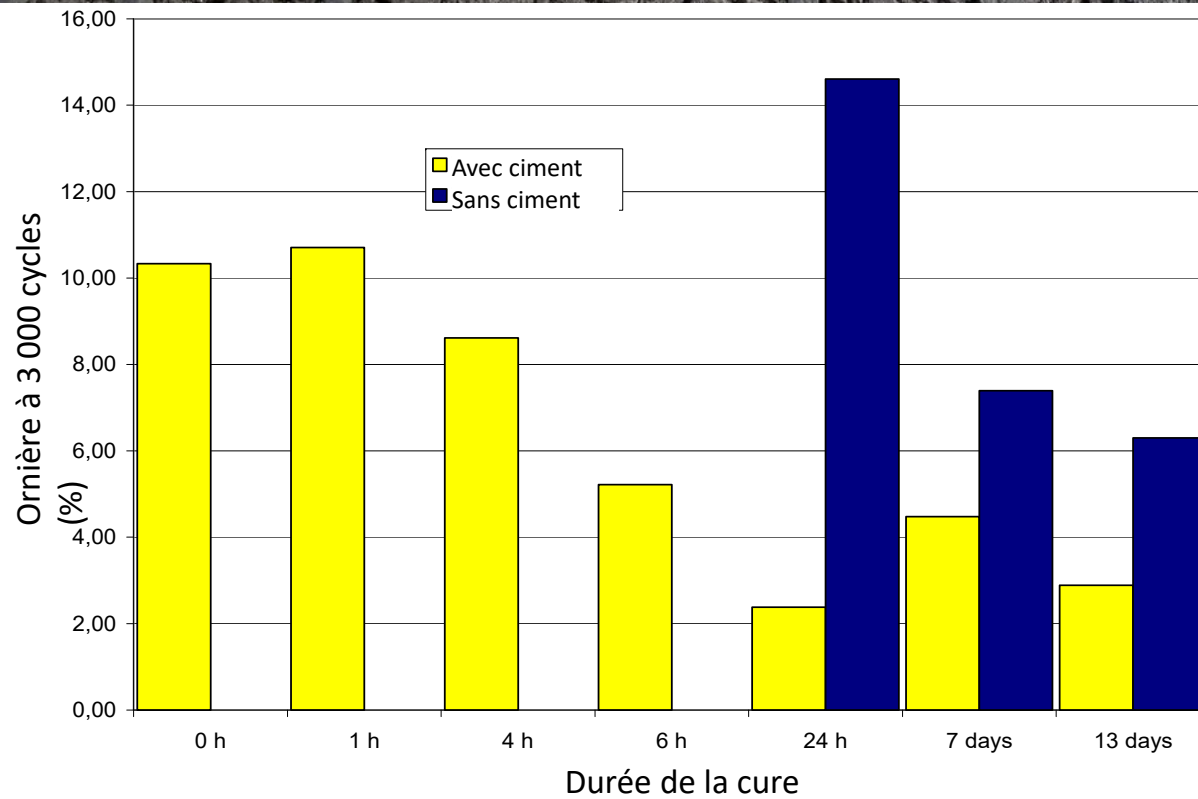
Comportement évolutif



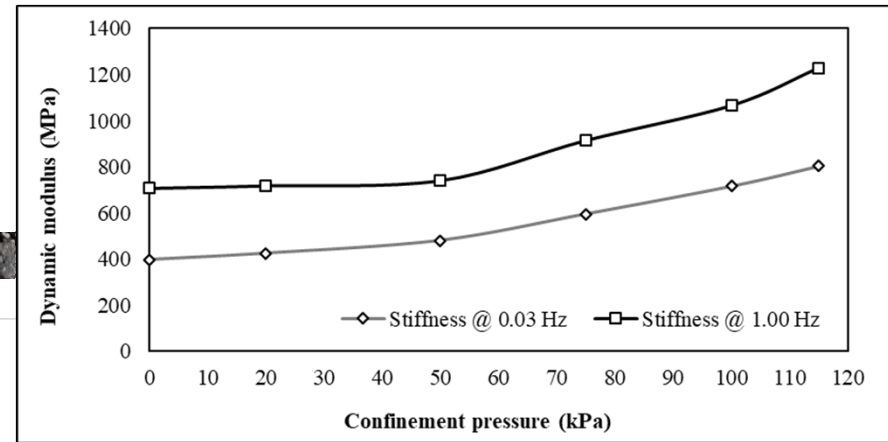
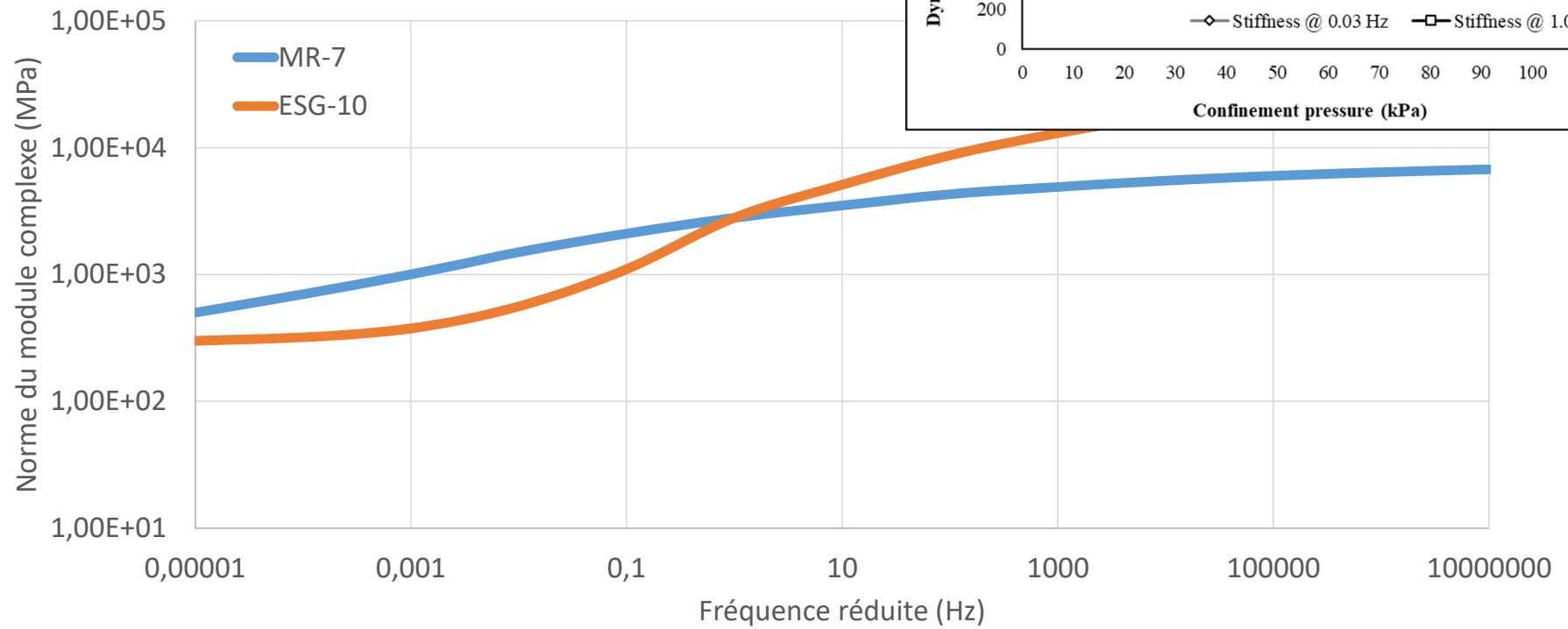
Comportement évolutif



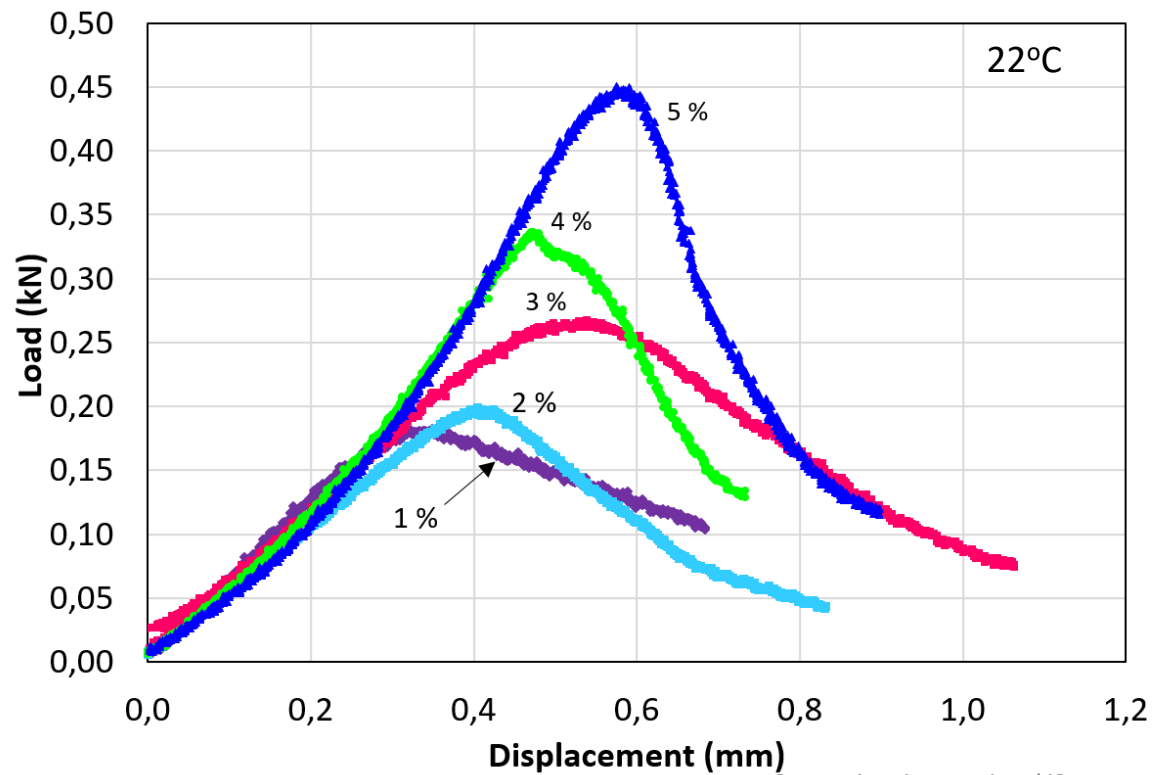
Comportement évolutif



Module complexe (20°C)



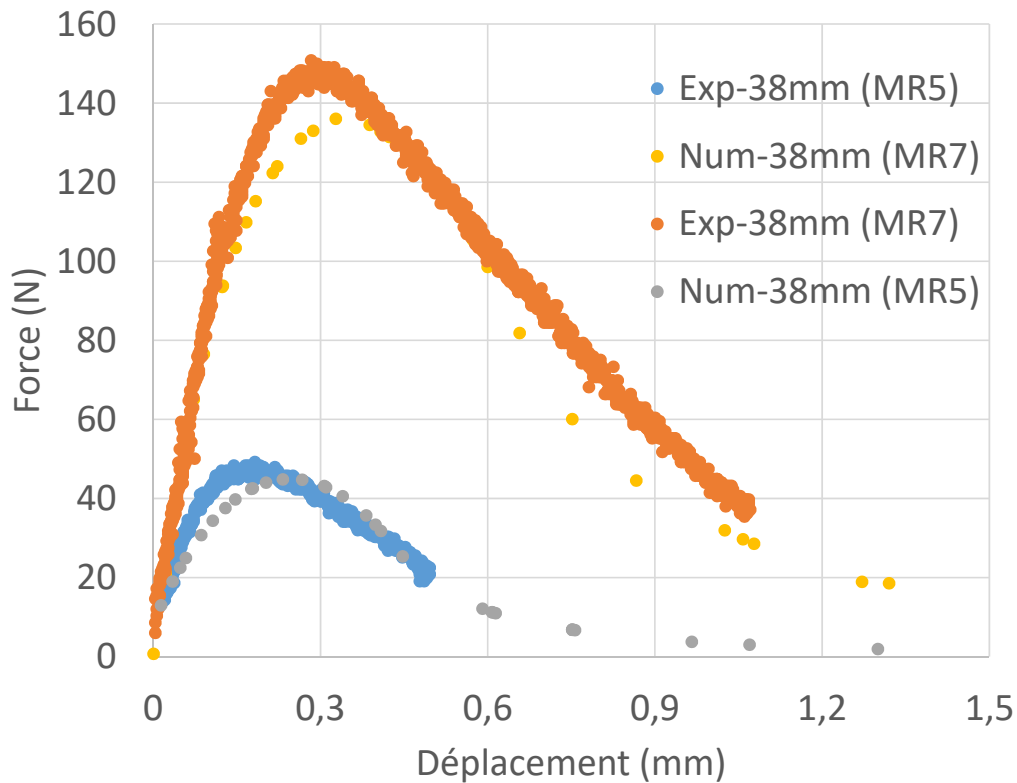
Essais de mesure de la propagation des fissures



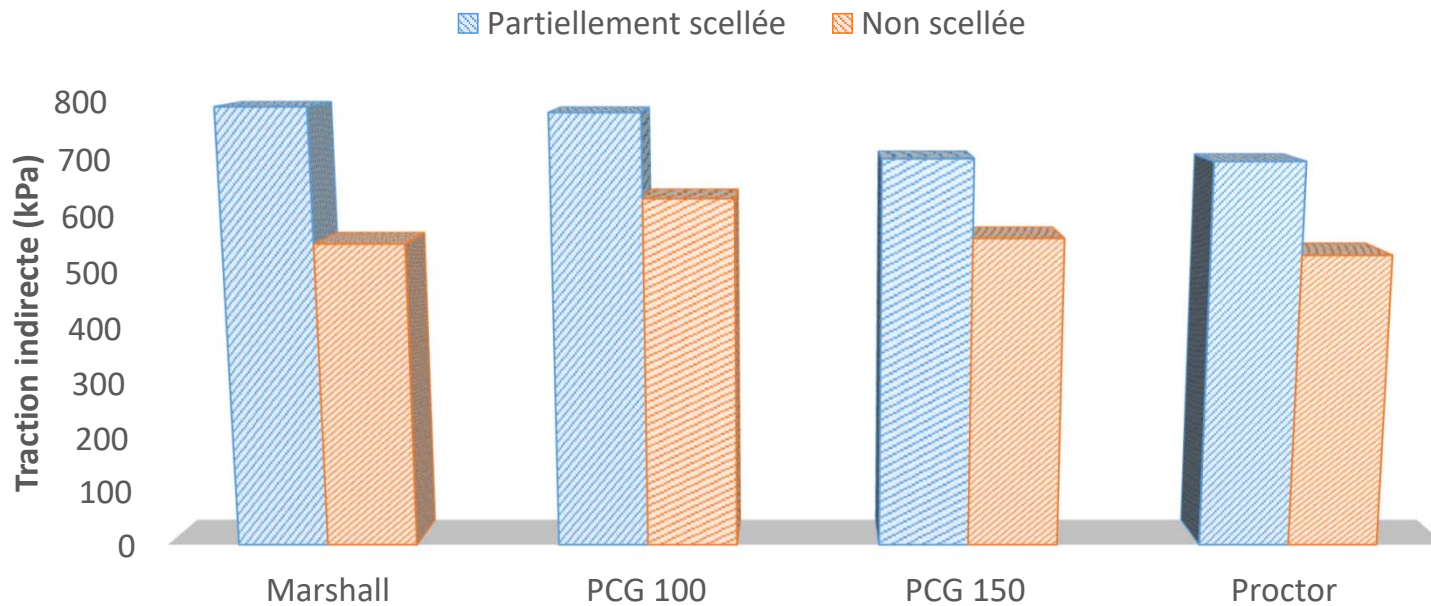
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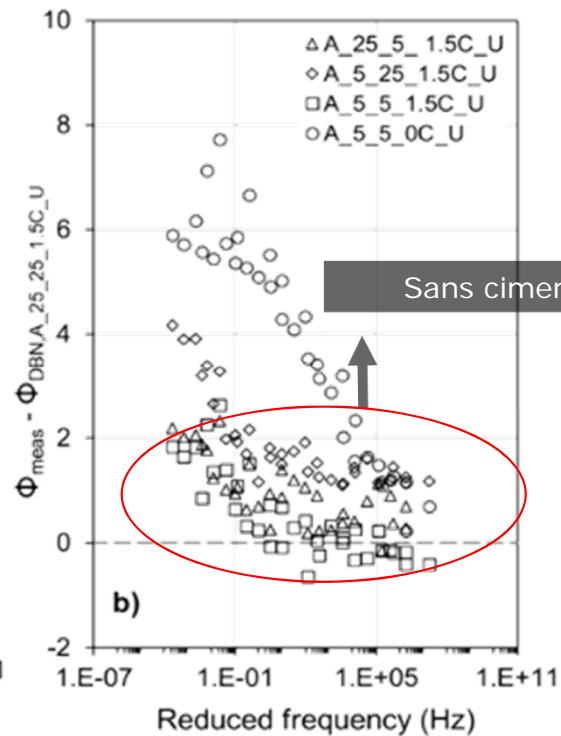
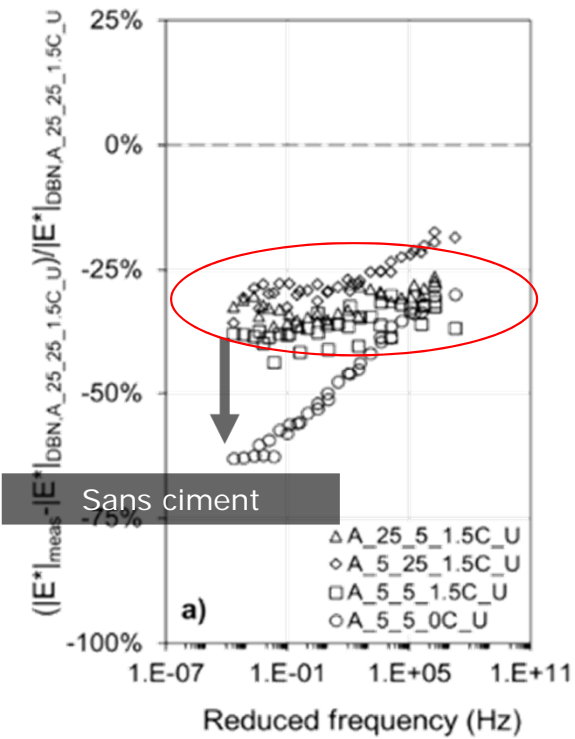
Essais de mesure de la propagation des fissures



Effet de la méthode de compaction



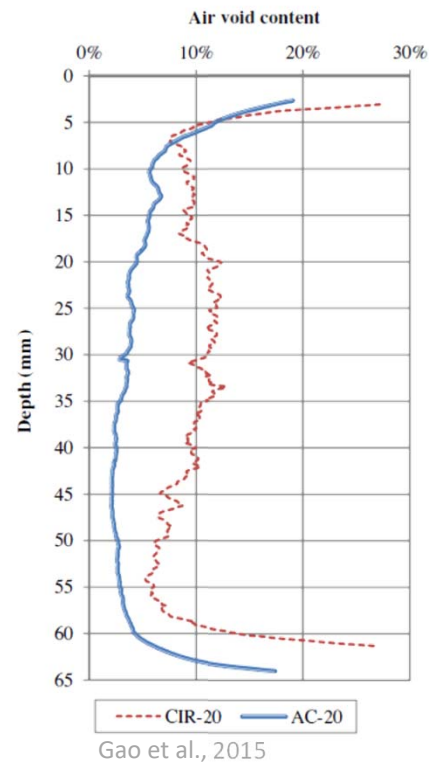
Effet de la température



Caractérisation sur site



- Comme les enrobés?
 - Teneur en air
- On peut recouvrir quand?
 - 2 semaines
 - < 2% de teneur en eau
 - Essai



Diefenderfer et al., 2020

Conclusion



- Reste beaucoup de travail à faire
- Les enrobés recyclés à froid performant bien sur chaussées
- Doit mieux caractériser le comportement évolutif
- Important de comprendre la dégradation
 - Méthode de dimensionnement ME

Questions





Alan Carter
alan.carter@etsmtl.ca



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