

# In-place Asphalt Recycling

#### Jean-Martin Croteau, P.Eng.

Manager, Quality Systems & Technical Development Works Alberta Ltd.



# Outline

- Characteristics & benefits
- Processes
- Energy & greenhouse gas
- Pavement engineering
- Profile correction
- Material engineering
- Recent advancement



## **Characteristics & Benefits**

#### Benefits

- excellent long term performance
- reduce cost of pavement rehabilitation
- minimized impact on the environment
- Energy savings
  - no heating of material required
  - $\circ$  no haulage of material on or off site required
- Principle of in-place recycling
  - the top layers of the existing pavement become a source of aggregate and binder that may be reused to create a new pavement layer

### **Cold Reclamation/Recycling Processes**



# Full Depth Process

# Partial Depth Process

Type recycling treatment and characteristics		Bituminous binder treatments			Hydraulic binder treatment	Composite binder treatment
		Partial depth treatment	Partial or Full Depth Treatment	Full depth treatment		Partial or Full Depth Treatment
Objective	Type of rehabilitation	Surf	face Stru		ctural	Surface or Structural
	Principle	Recycling of bituminous surface layers	Recycling of the full thickness of bituminous surface layers including some or a proportion of the underlying granular material		Creation of a new pavement material using the in-situ material	
In-place materials	Ratio of granular to bituminous treated materials	Bituminous material only	40 to 80 mm of bituminous material plus some underlying granular material	75 to 150 mm of bituminous material and 75 to 150 mm of underlying granular material		Bituminous material with or without underlying granular material
	Depth of treatment	60 to 120 mm		125 to 200 mm	200 to 300 mm	75 to 300 mm
Recycling system	Binder, aggregate and additives	Bituminous or rejuvenating binder	Bituminous binder		Cement or other	Blend of bituminous binder and cement or
		Cement or other pozzolanic additives may be added as catalyst to accelerate build up of cohesion			pozzolanic binders	other pozzolanic binders
		Corrective aggregate may be added to improve characteristics of the recycled mixture				
	Added binder content	0.8 to 1.5 % residual binder	1.3 to 2.0 % residual binder	1.8 to 4.0 % residual binder	3.0 to 6.0 % hydraulic binder	1.5 to 7.0 % composite binder

# **Energy & Greenhouse Gas**

### • Benchmarking exercise

o life cycle analysis tools

cradle-to-grave

### • Efficient techniques

#### Energy Use Per Tonne Of Material Laid Down



( Ontario

Ministry of Transportation Ministère des Transports

related techniques

rocesses



Abstract - Résumé



## **Pavement Engineering**

- Depth of treatment
  - o 70 to 90 % of depth of asphalt pavement up to 125 mm
- Traffic
  - no restrictions appropriate pavement design
- Preferred surfacing course selection
  - o sealing system mainly one lift of HMA
  - o two lifts of HMA on high volume roads
- Structural design properties
  - structural coeficients
  - reflective cracking

# Suggested Coefficients

	Coefficient (SLC), a <sub>i</sub>						
Bituminous Bound Materials							
New virgin and recycled hot mix	0.42						
Existing hot mix	0.14 to 0.28*						
Cold recycling of RAP off-site or in-pl	ce (cold mix) 0.28 to 0.38						
RAP/ Granular A blend stabilized with cement.	expanded asphalt 0.20 to 0.25"						
Existing cold mix	0.11 to 0.24						
Granular O Rubb lized POC slab	0.14 0.14 to 0.30 <sup>h</sup>						
Universited OGDL, mail A.C. stabilized or PC # Portland community Select subgrade mater	Miscellaneous Materials        al, ilized OODL material      0.14        case      0.26 to 0.34        asse      n5 <sup>4</sup>						
rooantly placed and well-people projects. * The numbers may change as * Applies also to old Chennia * Belect migrade material sho	valuation The lower limit (SLC = 0.14) may apply to resonaturation recorderwise is gained. May also apply to "rand cachion" that is part of yor ensent structure also considerwise be part of subgrade.						

Source: ARRA Meeting, Niagara Falls, Nov. 2009

# Reflective Cracking







## **Profile Correction**

- Cut & fill
- Profiling the roadway before the treatment
  *partial depth milling machine*
- Importing material
- Profiling the roadway after the treatment
  - additional surfacing material (padding)
  - profiling the roadway with a milling machine





## Recent Advancement



The image cannot be displayed. Your computer may not have enough memory to open the image, or the image may have been compated. Restart your computer, and then open the file again. If the red x still appears, you may have to delete the image and then insert it again.