Cold Asphalt Recycling for a Sustainable Future

2016 Arizona Pavement/Materials Conference

Arizona State University

November 17, 2016

Chuck Valentine

Pavement Recycling Systems, Inc.


DEAD
SLOW
BLIND
CORNERS


NOTICE
THIS RAMP MAY
BE CLOSED
INTERMEDIATELY
BETWEEN
AUGUST 25, 2014
TO
AUGUST 25, 2015

Cold In-Place Recycling

Cold In-Place Recycling (CIR) – an on-site process using a train of equipment consisting of cold planer(s), screening/crushing units, mixing units, pavers, and rollers. Traffic is returned to the roadway at the end of each shift.

Cold Central Plant Recycling

Cold Central Plant Recycling (CCPR) - a process where the asphalt recycling takes place off site or at a central location utilizing a stationary plant. Existing RAP stockpiles can be utilized or milled from an existing roadway, stockpiled, processed, hauled back and placed.

Brief History of Cold In-Place Recycling

How Did We Get Where We Are Today?

Early History – Late 70's Through the 80's

- Recycle "Trains" created – consisting of Milling Machine, Crushing and Screening unit, and Mixing/Processing unit.
- No mix designs used – difficulty correlating to standard HMA mix designs – different animal.
- Oregon DOT and Oregon State University provided much of the early research. Emulsion limits, gradation correlations, etc.
- Oregon, California, Arizona, Montana, Kansas DOT's among early users (western U.S.).
- Considered a low volume road process with an HMA overlay required. This was due mostly to the inherent "tenderness" of the finished product due to the type of emulsions used.

Next Progression – Late 80's – Early 90's

- Begin to utilize additives such as lime slurry and fly ash.
- Process begins to expand to urban areas and higher volume roads – still requires HMA overlay.
- Emulsions utilized in the process are "regionalized". CMS-2S in the NW, High Floats in the Midwest and SW, ERA type products in California.
- Push to develop mix design that could be applied to CIR as part of the ongoing "raise the bar" process. Make it more of a science and less of an art.
- In addition, specifications were evolving as well – in terms of processing equipment, paving equipment, QC/QA requirements.

Next Progression – 90's Through Early 2000's

- Mix design process develops along with engineered emulsions.
- Use of EE results in quicker "break" of emulsion, allowing earlier compaction and earlier return to traffic.
- Single unit trains are introduced which significantly reduced the CIR train footprint.
- Surface course no longer HMA overlay only – NDOT creates a Low Volume Road program where CIR surface treatment is single or double chip seal.
- State DOT's begin recycling on the Interstate – Nevada, Kansas, Utah, Oregon, California, Colorado. No longer considered strictly a low volume road application.

CIR Across the U.S. and Canada

Single Unit Train

Early 2000's to Present Day

- Thousands of miles of successful CIR projects have been completed.
- WSDOT, MDOT, NMDOT, ADOT have published reports on 25 years of CIR history.
- Begin to utilize foamed asphalt – mostly in the Northeast and Midwest. Also begin to specify cement in lieu of lime slurry and other additives.
- All western states are currently building/rebuilding their CIR/CCPR program – NMDOT, ADOT, UDOT are updating their specifications through a collaborative effort with industry.
- With continued improvement in the quality of the end product as well as state of the art emulsions, CCPR recycling becomes viable alternative to stockpiling (and forgetting about) RAP. RAP stockpiles can be processed to a specific gradation and utilized in many different applications (RAP chip seal, RAP slurry seal, CCPR).
- Continual creation of CIR "Champions".
- Project Selection continues to be paramount – right process in the right place at the right time!

Sustainable Treatments - Benefits

ENERGY USAGE, GREENHOUSE GAS EMISSIONS, LANDFILL REDUCTION, AND COST SAVINGS FOR SUSTAINABLE PAVEMENT TREATMENTS [1]					
SINCE 2009	COLD IN-PLACE RECYCLING	COLD CENTRAL PLANT RECYCLING	SUBGRADE STABILIZATION	PAVEMENT PRESERVATION	TOTAL
NUMBER OF PROJECTS COMPLETED	9 Projects	6 Projects	11 Projects	25 Projects	51 Projects
REDUCTION IN ENERGY CONSUMPTION (% or kWh) [2]	77%	77%	97%	80%	81%
REDUCTION IN GHG EMISSIONS (% or metric tons) [2]	79%	79%	97%	86%	85%
LANDFILL REDUCTION (CY)	28,000	16,000	96,000	121,000	261,000
COST SAVINGS (%)	45%	21%	74%	43%	47%
COST SAVINGS ($)	$4,804,000	$1,018,000	$9,165,000	$16,736,000	$31,723,000
690,000 TIRES WERE ELIMINATED FROM LANDFILLS BY INCORPORATES TIRE PARTICLES INTO THE ASPHALT HOT MIX					
(APPROX. 1,000 TIRES / 1 LANE-MILE / 1-INCH ARHM OVERLAY)					

[1] Chehovits, J. & Galehouse, L. (2010). Energy Usage and Greenhouse Gas Emissions of Pavement Preservation Processes for Asphalt Concrete Pavements. National Center for Pavement Preservation, Okemos, Michigan, United States (2010) https://www.pavementpreservation.org/icpp/paper/65_2010.pdf

[1] Chappat, M. & Bilal, J. (2003). The Environmental Road of the Future: Life Cycle Analysis, Energy Consumption and Greenhouse Gas Emissions. Colas Group. 2003. http://www.colas.com/sites/default/files/publications/route-future-english_1.pdf

18,000 metric tons of CO2E reduced = 3,800 passenger vehicles removed from roads*

** Based on latest updated of the average fuel economy and the emissions factor for the combustion of gasoline as of August 25, 2015. The emissions factor for passenger vehicles is 5.2 tons/vehicle/year. (www.epa.gov)*

Chuck Valentine
Business Development Manager
Pavement Recycling Systems – SW Division

623-285-5447

cvalentine@pavementrecycling.com