



COLD RECYCLING IN SOUTH AMERICA: PERÚ AND BRAZIL

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TDM – PERÚ

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Western States In-Place
Recycling Conference**





ASPHALT MODIFIED

The polymer modified asphalt binders are resulting from the physical interaction and / or polymer chemistry

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ASPHALT EMULSION

Asphalt emulsions are an economical, safe and environmentally friendly alternative for paving purposes, since management

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SOIL STABILIZER

Soil stabilizers CON-AID liquid chemicals are specifically designed to improve

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GABIONS

In our gabion structures are constituted by metal elements made of hexagonal mesh

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BARRIERS DYNAMICS OF ROCK FALL PROTECTION

Protection systems against rockfall are dynamic systems

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FOR EMULSION PRIMER (PRIMETEC)

Asphalt primer for PRIMETEC®, emulsions is a differentiated technology specially designed to service

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CORRUGATED METAL STRUCTURES

The corrugated metal structures SUPER-COR combine the advantages of a lightweight construction with high strength and durability of

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GCL (GEOSYNTHETIC CLAY LINER)

Geosynthetic clay liner consists of two geotextiles with a core

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Más allá siempre

Classification of Asphalt Emulsions in Perú and Brazil

Emulsion Types	Cationic	Applications
Rapid Set	CRS	Chip Seals and Tack/Bond Coats
Medium Set	CMS	Open-graded, patch, & pot-hole mixtures
Slow Set	CSS	Recycling mixtures & dense-graded virgin mixtures
Quick Set	CQS	Slurry seals & Micro-surfacing
Prime	CP	Penetrating Prime Coats



In Peru, **cold in-place recycling (emulsion-based)** has been used for over **20 years** to solve numerous pavement distresses in a cost-effective manner.

As in other parts of the world, CIPR in Peru has been used to **correct deficiencies** in pavements exhibiting fatigue cracking (age-related), transverse cracking, drainage inefficiencies, and other pavement distresses.

The use of CIPR has enabled Peruvian agencies to **restore pavement ride and performance quality** while maximizing the use of existing materials (avoiding new raw materials consumption) and minimizing traffic closures.

Significant service life extensions have been documented.

When and Why to Recycle in Perú and Brazil

- When the materials (bitumen and aggregate) in the aged pavement can be reused
- When fatigue and other distress levels have reduced ride quality to the point that the pavement is beyond repair and beyond its useful life.
- Emulsion-based cold recycling allows significant savings in materials costs and energy consumption.
- Analyses have shown that emulsion-based CIPR is environmentally friendly.

Metrics Applied to Decide When to Recycle

- When distresses (oxidation, cracking, raveling, etc.) reach medium to severe levels
- When the underlying pavement structure is sound (via FWD)
- When the thickness of the distressed surface course exceeds 5 cm

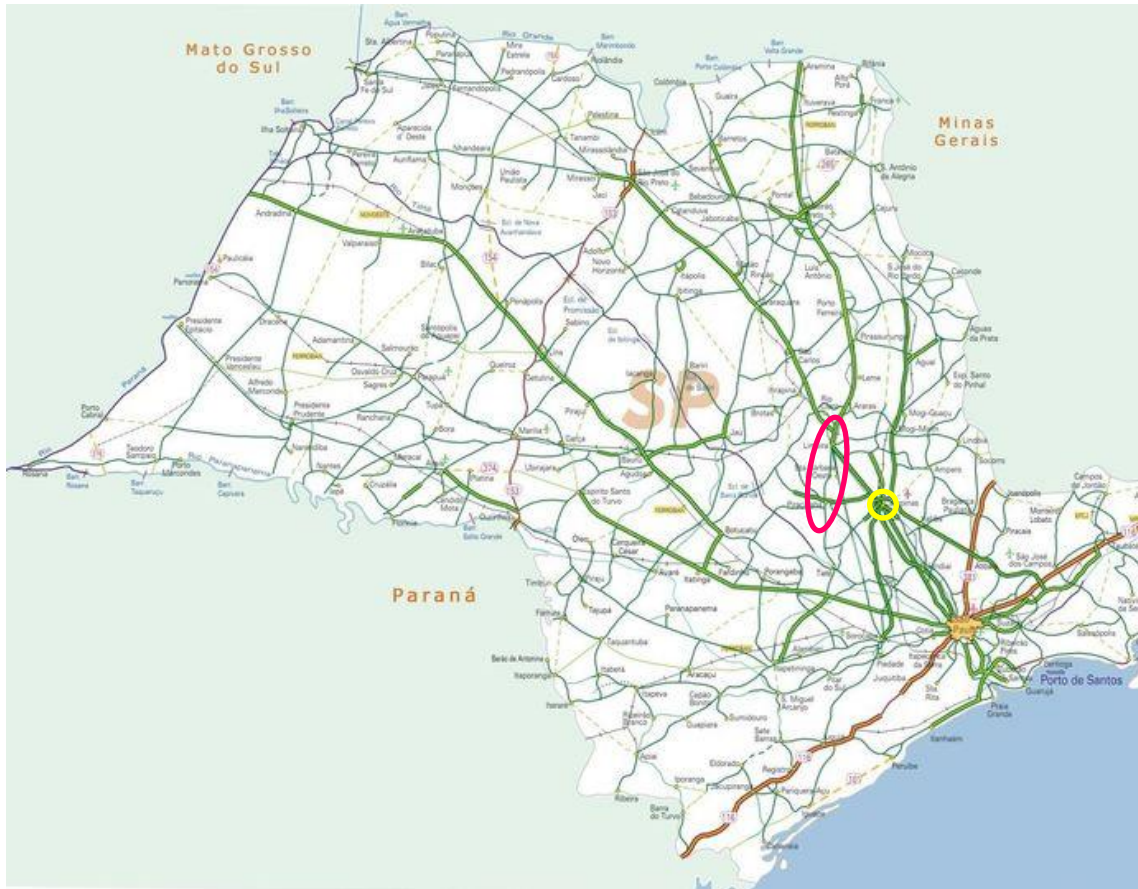


Example: Brazil, SP-147 Limeira - Piracicaba

Fatigued surface course, 7.5 cm thick

Emulsion (CSS-1h) with rejuvenator (aromatic oil) = 3% w/w RAP

Hydrated lime = 1% w/w RAP



- Tren de reciclado de carpeta asfáltica





- Crushed RAP scalped and sized
- Pug-mill mixing with CSS-1h



No virgin aggregate
back-added

Rough texture



Compaction with steel wheel
and PTR



CIPR Lift After Compaction



Overlay with Type-III Micro-Surfacing

Pre-mix water = 7% w/w aggregate

Cement = 1% w/w aggregate

Cationic Quick-Set Emulsion (CQS-1h) 12% w/w aggregate (ISSA A-143)



Full-Depth Reclamation: Perú, Shiran Otuzco – Trujillo

Severely aged (ravelled away) pavement on unbound granular base

Base aggregate was usable (no virgin back-add)

Slow-Set bitumen emulsion (CSS-1h) = 3% w/w aggregate (RAP + base)

Cement = 0.5% (w/w RAP + base)





Dense surface after rehabilitation

Structural coefficient doubled from $a_2 = 0.14$ to $a_2 = 0.27$ (AASHTO 93)



Excelent cohesion development (photo taken after 15 days of traffic)



An HMA overlay was applied as final wearing course.



FDR– Perú, Conococha Huaraz Molino pampa

- 7.5 cm HMA severely distressed by alligator cracking and pot-holes
- Traffic upgrade required 20 cm lift with a minimum $a_2 = 0.26$
- Virgin back-add requirement was 25%
- 2% Foamed bitumen was used for stabilization
- Cement = 0.8% w/w RAP + base + virgin back-add
- Job site location was at 4200 metros (13,780 feet) and so cement levels were minimized.
- Night temps: -14°C
- Day temps: 22°C



Virgin back-add



Reciclado con asfalto espumado (Foamed AC)



Reciclado con asfalto espumado (Foamed AC)



Conformación de la superficie de la base reciclada



Superficie de la base reciclado con asfalto espumado (Foamed AC)



Imprimación de la base reciclada



Micro-Surfacing Overlay on FDR Treatment



Setting of the Micro with PTR



Finished Overlay



Project After 4 Years of Service



....after 4 years service



- Excellent ride quality via IRI.
- FWD tests showed continued, long-lasting durability of the structure

THANK YOU

