HOT AND COLD MODIFIED APPLIED CHIP SEALS

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Purpose of this Presentation

- Overview modified hot and cold applied chip seal products that are used in the market
- Introduce the product
- Discuss the performance of the product
- Identify the advantages of the product
- Provide contact information for follow-up questions

Disclaimers

- Not an advertisement for any of the products or processes
- No endorsement or criticism of the products and processes are implied
- Not all inclusive, based on the authors knowledge and experience

Products and Processes

- Hot applied chip seals containing crumb rubber modifier (CRM)
  - Asphalt rubber, used since the 70's
  - Terminal blend/rubber modified binder, used since the 80's
- Warm mix CRM chip seals, used in the past 3-4 years
  - Asphalt rubber
  - Terminal blend/rubber modified binder
- Polymer modified emulsion chip seals, used for a long time
  - Scrub seals
  - Polymer modified emulsions
- Fibermat chip seals, used in the west past 3-4 years. Used in the USA since 2003

Asphalt Rubber (AR) Chip Seals

- Used since the 70's
- Asphalt rubber with at least 20% CRM
- Rubber is reacted at a centralized mix site at elevated temperatures
- Applied at 0.6 gal/sq.yd. followed by hot pre-coated chips
- Used in California, Arizona, and Texas

AR Chip Seals

- 8 to 10 mesh rubber-used extensively in Arizona and California
- Performance can be 25 years or more if done right
- Biggest problem with reduced life is material quality/workmanship

Typical Applications of AR Chip Seals

Typical Applications of AR Chip Seals

Emission Control System Used in California

- Emission control equipment used to reduce emissions from hot applied binder
- In the past, this has reduced the number of providers who could apply the product.
- Currently, public domain emission control equipment is available.
- Other states do not require this equipment, but could in the future.

Terminal Blend/Rubber Modified Binder Chip Seals

- 30 mesh rubber mixed with asphalt at the terminal
- CRM content has varied from 5 to 20%
- Product has been used since the 80's in Texas
- Product is also used in California, Arizona, Oregon and other western states

Terminal Blend/Rubber Modified Binder Chip Seals

- Low rubber content CRM has been used since the 80's
- Application rates are much lower than AR
- Behaves like a polymer modified asphalt and can be PG graded

Terminal Blend/Rubber Modified Binder Chip Seals

- High CRM content, over 15%, only used in past 3-5 years.
- Application rates are about 0.4 gal/sq.yd.
- Long term performance still to be determined

CALTRANS Dist. 9
09-342804 PG76-22TR
Hwy 395 Mono County
Mile Marker 84 to 108
.42 gals/sq.yd. Ap. Rate
21 lb ag. Ap. Rate
2.3 miles MM 84 to 86.3 SB are warm mix test section Shot at 330/335°F.


Ambient temperature
8:00 AM 63°F 3:00 PM 78°F
Pavement Temps
8:00 AM 70°F 3:00PM 95°F
Binder Temperature
355˚F

Mainline AR Gap Grade
Shoulders 70-10 dense grade

Hot Applied Chip Seals with WMA

- Has been used only in the past 2-3 years.
- Lowers the temperature of application
- Reduces visible emissions or need for emission control equipment. Further evaluation is needed.
- Short term performance still under evaluation
- Long term performance has not yet been established

Asphalt Rubber with WMA

Terminal Blends and Asphalt Rubber

Use of Products by Caltrans

CALTRANS
District 2
SR 36 Red Bluff, CA
PG76-22TR
Warm Mix
@ 335ºF
0.45
Gallons/sq.yd.

Use of Product by Local Agency

- Asphalt rubber Cape Seal used in City of Fort Bragg
- Cool weather in Caltrans District 1 which is concerned about emissions
- District 1 has use considerable warm mix in hot mix

Fort Bragg Project

Fort Bragg Project after Slurry Seal

Scrub Seals Using Modified Emulsions

- Used in the western United States since the late 80's
- Consists of a polymer modified rejuvenating emulsion which is scrubbed into the existing surface followed by an application of rock
- California and Arizona are developing a generic spec for the emulsions

Advantages

- No crack filling is required
- Can be applied at both low and high temperatures

  (40^{o} F - 120^{o} F)

- High flexibility

  (3.5 % Polymer)

- Will work with dirty chips

Scrub Seals using PMRE

Scrub Seals using PMRE

Typical Applications of Scrub Seals

Interlayer with Micro Cape

Interlayer w/ PMCRS-2h Chip

Polymer Modified Emulsion Chip Seals

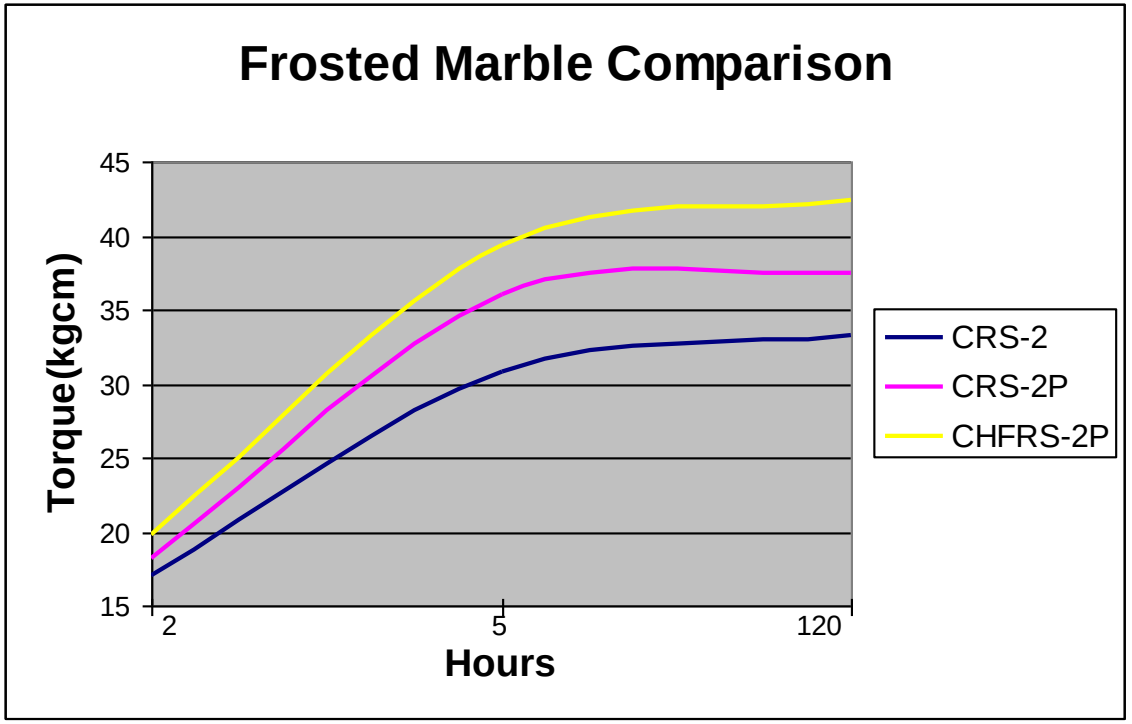
- Typically CRS-2P cationic rapid set Polymer Modified emulsion.
- CHFRS-2P Cationic High Float Rapid set Polymer Modified emulsion
- Improves chip retention

CRS-2PC

CHFRS-2P

Polymer Modified Emulsions

- Cationic rapid set emulsions
  - Conventional CRS-2
  - CRS-2P
  - CHFRS-2P High Float
- Polymer Modified Improved chip retention faster and Stronger



MATERIAL APPLICATION RATES

- **1/4 Chip seal .24-.26 Gal/SY of Emulsion**
  Cover Aggregate **16 lbs/SY Minimum**

- **5/16 Chip seal .26-.32 Gal/SY of Emulsion** **Most Typical Urban Areas Streets**
  Cover Aggregate **18 lbs/SY Minimum**

- **3/8" Chip seal .30-.34 Gal/SY of Emulsion** **Most Typical Rural Areas**
  Cover Aggregate **20 lbs/SY Minimum**

- **1/2" Chip seal .38-.42 Gal/SY of Emulsion**
  Cover Aggregate **lbs/SY Minimum 23 lbs/SY**

- **CQS-1h or CSS-1h Fog seal 50/50 Shot rate .08 Gal/SY Minimum for" 1/4 and 5/16 .10 Gal/SY Minimum for 3/8".11 Gal/SY Minimum 1/2"**

Notes: The specific emulsion/cover aggregate application rates shall be determined using factors such as surface temperature, traffic volume, existing road condition, and time of year. The Contractor may alter the application rate at any time during the course of the construction upon approval by the Project Manager.

Typical Applications

Typical Applications

Note the Chip Spreader is right behind the Asphalt Emulsion Distributor

3 Medium Pneumatic or 4 Light Pneumatic rollers are recommended keep them moving

Typical Application of Flush Coat

Fog Seal of emulsion at end of Hot Asphalt or Emulsion Chipping process aid in Chip Retention 0.08 to 0.12 gallons per sq. yd.

Finished Roadway, 3/8 inch Chip Seal with a 0.10 gallon fog seal , and new stripes.

FiberMat®, A Colas product

- Crack resistant membrane produced by engineered fiberglass strands impregnated between polymer modified asphalt emulsion in one process
- Can be used in a chip seal, Cape Seal, or overlaid with HMA/WMA

Benefits of FiberMat®

- Provides a waterproof membrane
- Fiberglass provides reinforcement to absorb stresses
- Delays the propagation of cracks
- Better Chip Retention
- 100% recyclable
- Uses CRS-2P Emulsion
- Fast & Continuous

Typical Applications

County of San Bernardino, CA

- Used as an interlayer on roads, highways, taxiways, and runways throughout the US and Canada
- Developed by Colas UK 20 years ago
- In US, since 2003
- On West Coast, since 2010
- 15 machines throughout Canada, US, and Mexico

Typical Applications

Mohave County, AZ
Binder Rate- .48 gals/sq.yd.
Fiber Rate- .15#/ sq.yd.

May 2013

August 2013

135,000 square yards. Ambient temperature was 111°.

Typical Applications

Mohave County, AZ
Binder Rate- .53 gals/sq.yd.
Fiber Rate- .18#/ sq.yd.

Before

3 months after

Successful, multiple case studies for cold-weather climates are available upon request.

Summary

- A variety of hot and cold applied modified asphalt chip seal products are used in the western United States
- Some are well established products with good long term performance
- Others are newer products where the long term performance has yet to be established
- All products are designed to either promote better performance, better rock retention, or to help reduce reflection cracking. They are not equal in long term performance nor do the cost the same
- For more information, please contact those indicated in the presentation

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THANK YOU FOR YOUR ATTENTION

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Any Questions

Placing the right treatment on the right pavement and at the right time. It also must include quality materials and construction