Diamond Grinding Slurry
Best Management Practices

Concrete Pavement Preservation
*Integrating Engineering, Economics and the Environment*
Introduction

- John Roberts
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  - Vice President – American Concrete Pavement Association’s Concrete Pavement Preservation Partnership (CP³)
Looking Back In Time

In the not so distant past noise, ride quality, and customer comfort (functional considerations) took a back seat to structural considerations.
Transportation Authorities React

- Specifiers now place greater emphasis on tire/pavement noise, smoothness and construction delays.
  - Development of tighter smoothness and new noise specifications.
  - Development of low noise surface treatments.
  - Increased use of sound walls.
  - Night work becomes the norm.
  - Safety concerns still paramount!
Performance Matters!

- Bristol Motor Speedway
Diamond Saw Cut Surface Textures

- Increasingly Specifiers are utilizing diamond saw cut surfaces textures to reduce roughness, reduce noise and increase the friction of their pavements, bridges and runways.
  - Economical
  - Long-lasting
  - Effective
  - Environmentally Friendly

Next Generation Concrete Surface

Conventional Diamond Grinding
What is Diamond Grinding?

- A stack of closely spaced diamond tipped saw blades is used to remove a thin surface layer of the pavement while increasing macrotexture.
- Results in smooth, level pavement surface.
- Provides a longitudinal texture with desirable friction and low noise characteristics.
- It is the most common CPP treatment utilized today and is frequently performed along with other CPP techniques, such as patching, undersealing, dowel bar retrofit, and joint sealing.
Blades and Spacers
Typical Conventional Diamond Grinding (CDG) Blade Configuration

- Land Area: 0.090 (2.3 mm)
- Saw Blade Segment: 0.125 (3.2 mm)
- Saw Blade Core: 0.105 (2.7 mm)
- Spacer: 0.110 (2.8 mm)
Diamond Grinding Equipment
Diamond Grinding Process
Advantages of Saw-Cut Textures

- Cost Stable - Often cost less than AC overlays;
- Enhances smoothness, surface friction and safety
- Favorable M&PT - Can be accomplished during off-peak hours with short lane closures
- Texturing of one lane does not require grinding of the adjacent lane
- Does not affect overhead clearances underneath bridges, signs or tunnels
- Blends patching and other surface irregularities into a consistent, identical surface
- Environmentally friendly and sustainable
The Facts of (Pavement) Life
Nothing in Life is Perfect!
Concrete Sawing Residue - Slurry
What is Slurry?

- Inert, typically nonhazardous (<12.5 pH) byproduct of the diamond grinding process
- Combination of the cooling water and the concrete fines brought into suspension during the sawing process
- Water is introduced to the saw blades to increase their life expectancy, decrease dust emissions and increase worker safety
Saw Cutting Slurry
Diamond Grinding Slurry
On-Board Slurry Vacuum System
Resultant Near-Dry Surface
IGGA - Best Management Practices

- Slurry spreading disposal
- Slurry collection and pond decanting
- Slurry collection and plant processing
- Slurry collection and recycling
- Alternative solutions
Slurry Spreading Disposal

- Most Efficient
- Least Expensive
- Most Ecologically Sound
- Most Unattractive!
Specs Are Driven by Poor Performance
NYSDOT Guidance

........the disposal of pavement diamond grinding slurry can occur at a site(s) under the control of a transportation agency, such as, but not limited to, NYSDOT, the Thruway Authority, or municipal (county, city, or town) highway departments provided, however, that said agency provides proper oversight of the generation and placement of the slurry to assure that the slurry is not contaminated with the spill of a petroleum product and is not comingled with other solid waste during the process. The basis of this determination is that under the preconditions above, diamond grinding slurry can be determined to be recognizable and, therefore, the site at which it is placed qualifies for exemption pursuant to 6 NYCRR 360-7.1(b)(1)(i).
Slurry Spreading Disposal

- Used in rural areas that have vegetated slopes
- Engineer and Contractor should conduct a site inspection identifying sensitive areas
- Slurry spreading start and stop points should be clearly marked on road shoulder
- Slurry must be picked up and hauled while grinding in these areas
Slurry Spreading Disposal

- Vacuumed slurry should be spread evenly on adjacent slopes
- Slurry should not be spread within 100 ft. of any natural stream or lake, or within 3 ft. of a water filled ditch
- At no time will slurry be allowed to enter a closed drainage system
One of the main concerns with applying slurry to soils is the liming effect and subsequent increase in soil pH.

Three things effect the pH of the saw slurry:
- Composition of the concrete
- Quality of the water used to cool the blades
- Amount of removal and quantity of water used
Increasing acidity

Neutral

Increasing alkalinity

Source: Environment Canada
Grinding Slurry Lime Analysis

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QUALITY ANALYSES FOR INFORMED DECISIONS ©

TO: [Blacked Out]
ATTN: [Blacked Out]

LAB NUMBER: [Blacked Out]
SAMPLE ID: Lime

LIME ANALYSIS

DATE RECEIVED: 9/22/2015
DATE REPORTED: 9/25/2015
PAGE: 2 of 2

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Adjusted Lime Application Rate = Recommended Rate of Standard Lime x (2000 / ENP)
Grinding Lime Slurry Analysis

- In MN 1000 ENP lime is considered a high quality agricultural lime

- Diamond grinding slurry analysis is on average similar to 50% strength agricultural lime
NDSU Conclusions

“Current CGR (slurry) materials, at least those represented in this study*, do not present a hazard. While direct deposition of the CGR machine product on the vegetated parts of highway rights-of-way may be unsightly to some, the environmental impact is negligible.”

*Slurry samples collected from MN, WA, CA, MI and NE were represented in this study
CALTRANS CGR Characterization

- The fresh water samples and slurry samples for inorganic and organic constituents displayed no hazardous characteristics when compared to Title 22 haz-waste standard
  - Holmes & Narver
CALTRANS Slurry Report

“The 96 hour acute toxicity testing showed no toxicity characteristics as manifested by the 100% survival rate of the test fish. Based on these results the slurry samples represent no toxic threat to public health and the environment.”
MNDOT Slurry BMP

- The state of MN passed legislation allowing for the deposition of slurry on the roadway shoulders in certain situations.
- MNDOT developed a Slurry Disposal BMP to assist contractors.
NDOR Slurry Research

“This study showed that it is plausible to apply CGR slurry at rates up to 40 dry tons/acre on medium to fine textured soil without negative effects and provides evidence that rate higher than the current regulated limit of 5 dry tons/acre may be applied on roadside with similar soil characteristics as this study.”
“CGR produced from concrete grinding operations is not hazardous waste, but is elevated in pH and requires appropriate management. Best management practices should be implemented for CGR, and examples of such practices are available. If CGR is discharged adjacent to roadways, care must be taken to avoid impact on ecosystems.”
While the direct discharge of DGS from the grinding machine resulted in application rates that exceeded the recommended agronomic rates, there did not appear to be any short-term adverse impacts to the soils, vegetation, or surface runoff (as measured by concentrations of TSS, TP, Ca, Mg, Pb, and pH) from the sites.
Other Options Are Available
Slurry Collection & Pond Decanting

- Used in urban areas with closed drainage systems
- Slurry collected in water-tight haul units and transported to settlement ponds
- Ponds located within or outside of right-of-way – water is decanted and reused on job
- Upon completion solids used as fill, lime or other commercially useful application
Water-tight Haul Units

Evergreen Floating Bridge - Seattle
Slurry Decanting Area
Slurry Decanting & Pond Processing

- Cheaper than disposal in Type II landfills or plant processing
- Keeps all project elements on project site when kept in right of way
- Facilitates recycling of slurry on other parts of the project
Slurry Collection & Plant Processing

- Slurry is collected and hauled to processing plant in water-tight haul units
- Various plant designs available such as centrifuge and belt press
- The site will be prepared to control any storm water runoff
- Processed water and solids are handled in same fashion as in decanting ponds
Processing Plants
Slurry Collection & Plant Processing

- Allows for 100% control of the slurry product cradle to grave
- Final product is a cement and aggregate based solid that can be used as fill
- Plant setup expense makes it prohibitively expensive to use on smaller projects
- Operating costs can significantly increase the sq-yard grinding cost
Additional Disposal Options
National Trends

What’s New And Exciting?
Tanker Based Water Recycling

- Reuse Water Return to Grinder
- Reuse water for agitation
- Mixing Tank
- Settling Tank
- Clean Water Tank
- SlurrySep Addition
- Eductors
- Solid Fines Removal

Up To 80% Water Recyclable
Slurry Treatment Vessel

Add Flocutator to introduce SlurrySep run off 12 volt system and trucks air supply.

Use Current Pumps to Circulate Reuse Water.
Mobile Filter Press Units
Beneficial Use Determinations

- Soil stabilization
- Agricultural lime
- Fill
- Waste water treatment plants
- Power plants
Soil Stabilization
Agricultural Lime
Waste Water Treatment Plants
Power Plant Operations
Power Plant Operations
IGGA Slurry BMP

- Provides guidance related to slurry disposal
- Highlights best practices and methods for slurry disposal
- Give definitions of key terms
- Provides additional information resources
IGGA Slurry Summary Fact Sheet

- IGGA Fact Sheet developed in 2016 summarizing the most important facets related to slurry and its disposal.
IGGA NDOR CGR Research FS

- IGGA Fact Sheet summarizes the most important findings related to the NDOR Slurry Research efforts conducted to date.
Summary

- Slurry is not nuclear waste! Landfill disposal is not environmentally sound.
- Slurry has a number of constructive uses that are ecologically beneficial.
- Specifiers and contractors must work together to determine best reuse/disposal methods available.
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