



# **Full Depth Reclamation NYSCHSA Winter Conference January 17, 2018**

**Todd Konifka & Fred Wickham  
Technical Sales Team Members  
The Gorman Group**

**All Roads Lead To  
GORMAN**  

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- **Presenter Information**

- **Todd Konifka, The Gorman Group – 29 years**
  - **Technical Sales Representative – 17 years**
  - **Cold Mix Paving Crew supervisor**
  - **Knowledgeable in all Gorman Group processes**
- **Fred Wickham, The Gorman Group, 16 years**
  - **Technical Sales Representative – 16 years**
  - **Town Highway Superintendent, Westmoreland – 11 years**
  - **Knowledgeable in all Gorman Group processes**



# Presentation Outline

- **General Information - Why Reclaim?**
- **Advantages**
- **Construction Process**
- **Mix Design – Selection of Additive**
- **Candidate Selection**
- **Questions / Comments**



# Acknowledgements

- **Most Technical Information from:**
  - **GEM-27**
  - **Design and Construction Guidelines for Full Depth Reclamation of Asphalt Pavement**
  - **NYSDOT Geotechnical Engineering Manual**
    - **August 2015, Revision #1**



## **Full Depth Reclamation- General Info**

- **What is Full Depth Reclamation?**
- **A Pavement Rehabilitation technique that reuses existing materials**
- **Per NYSDOT – “a recycling method where all of the asphalt pavement section and a predetermined amount of underlying subbase material are treated to produce a stabilized base course.”**



## **Full Depth Reclamation - General Info**

- **Why use Full Depth Reclamation?**
  - **Rehabilitate existing pavement without reconstruction**
  - **Reuse valuable resources**
  - **More Cost Effective than Rehabilitation**



## **Full Depth Reclamation - Advantages**

- **Conserves aggregate and energy**
- **Converts existing pavement and subbase to new subbase**
- **Eliminates existing pavement defects**
- **Restores cross slope and crown**
- **Cost effective**
- **Service life up to 15 years**
- **No hauling materials except for additives under normal conditions**



# Full Depth Reclamation - Process

- **Pulverization**
- **Introduction of Additive**
- **Compaction**
- **Application of wearing surface**





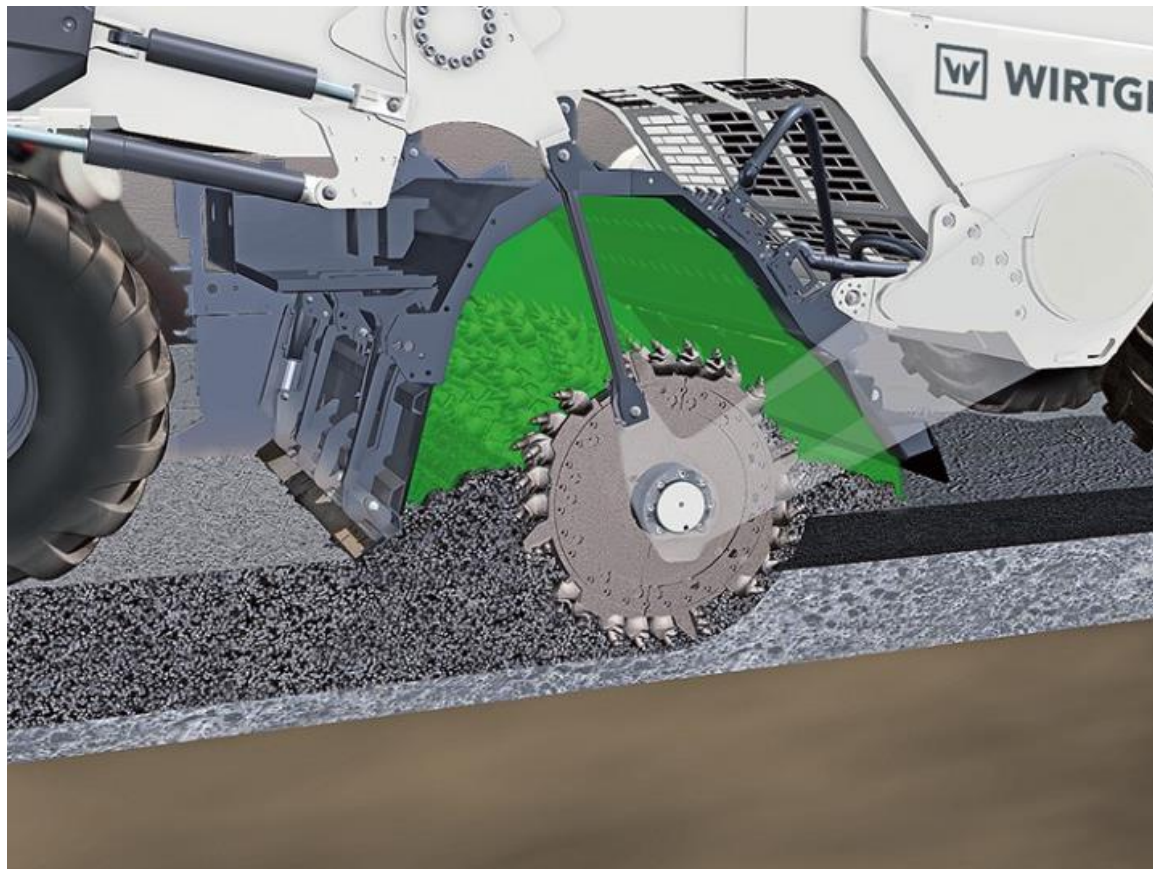
# Pulverization

- **Reclaimer**
  - 6 to 8 ft widths
  - Up to 16 inch depths
  - 400+ horsepower
  - Average 25 ft/min





## Reclaimer Schematic





## Reclaimer – Wirtgen WR 2500





## Reclaimer – Wirtgen WR 2400



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## Reclaimer – Terex RS 950





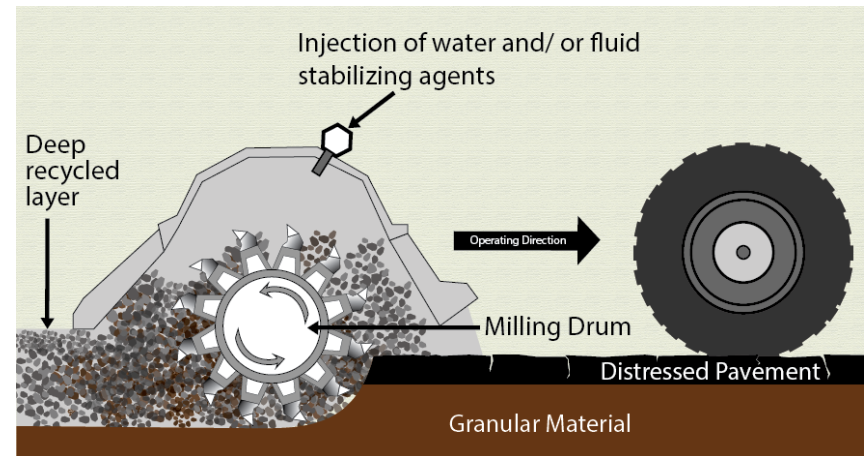
## Reclaimer – Caterpillar RM300





# Introduction of Additive

- **Stabilizing additives introduced at metered rates in Milling Chamber**
- **Can be broadcast on road ahead of reclaimer**





# Grading and Compaction

- **First pass by Sheepsfoot Roller**
- Followed by Grader
- Followed by Vibratory Roller







# Grading and Compaction

- First pass by Sheepsfoot Roller
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# Grading and Compaction

- First pass by Sheepsfoot Roller
- Followed by Grader
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# Application of Wearing Surface

- Hot Mix Asphalt – NYSDOT 4 inches
- Chip Seal
  - Double
  - Triple





# Videos

- **Show videos here**
  - **Gorman**
  - **Wirtgen**



# Mix Design – Candidate Selection

- **Low Volume roads - <2,000 AADT**
- **Groundwater elevation**
  - **2 ft below top of subbase, or**
  - **1 ft below bottom of subgrade, whichever is lower**



## **Mix Design – Selection of Additive**

- **Determine FDR Depth – 4 to 12 inches**
- **Full depth cores – 1.5 x FDR depth**
  - **4 six inch cores per lane mile**
- **Adjust FDR depth if needed**



# Mix Design – Selection of Additive

- **Cores tested for:**
  - **Moisture content**
  - **Sieve analysis**
  - **Hydrometer particle size analysis**
  - **Liquid limit, plastic limit**



# Mix Design – Selection of Additive

- **Portland Cement**
  - **Increases strength**
  - **Best for **granular** and low plasticity subbase or subgrade**
  - **More is not better**





# Mix Design – Selection of Additive

- **Lime**
  - Mitigates effect of reactive **clay** in base
  - Reduces plasticity
  - Aids in resisting water damage
  - Increases tensile and compressive strengths



# Mix Design – Selection of Additive

## ■ Calcium Chloride

- Lowers freezing point of reclaimed base
- Reduces freeze/thaw problems
- Increases load bearing capacity of base
- Used for **gravels** (no silt), **well graded sand**
- Can be added in 3 steps, primary, blending, secondary to seal the surface



# Mix Design – Selection of Additive

- **Fly Ash**
  - **Forms cementitious bond**
  - **Increases impermeability and strength**
  - **Spread with mechanical spreader and blended with reclaimer**



# Mix Design – Selection of Additive

- **Bituminous Materials**
  - Asphalt Emulsion or Foamed Asphalt
  - Increases cohesion and load bearing capacity
  - Used for **gravels** and **well graded sand**



## **Mix Design – Selection of Additive**

- **Choose additives based on Percent Passing No. 200 sieve and Soil Type**
- **Previous guidance plus Table 2 from NYSDOT GEM-27, Design and Construction Guidelines for Full Depth Reclamation of Asphalt Pavement**



Percent Passing No. 200	Plastic Index	Stabilizer	Soil Type												
			Granular Material						Silt-Clay Material						
			Well-graded gravel	Poorly graded gravel	Silty gravel	Clayey gravel	Well-graded sand	Poorly graded sand	Silty sand	Clayey sand	Silt, Silt with sand	Lean clay	Organic silt/Organic lean clay	Elastic silt	Fat clay, fat clay with sand
			GW	GP	GM	GC	SW	SP	SM	SC	ML	CL	OL	MH	CH
			A-1-b or A-2-6	A-1-b	A-3 or A-1-b	A-2-4 or A-2-5	A-2-6 or A-2-7	A-4 or A-5	A-6	A-4	A-5 or A-7-5	A-7-6			
<12	<6	Calcium Chloride													
	<6	Bituminous													
	<10	Cement													
	>10	Lime													
	<10	Cement													
	10-30	Lime													
	>30	Lime+cement													

**Table 2 Correlation of Stabilization Agent as a Function of Soil Type, Percent Passing No. 200 Sieve, and Plastic Index (Morian, et al., 2012)**



# Full Depth Reclamation - Cost - Options

- **Relative Cost**
  - **Inexpensive - \$1.50/sy + additives**
- **Options**
  - **No additives**
  - **Additives - add \$1.00 to \$3.00/sy**
    - **Calcium Chloride, Portland Cement, Emulsion, Lime, Fly Ash**
- **Overlay**
  - **Double or Triple Chip Seal**
  - **Conventional HMA 3 to 4 inches in depth**



## **Full Depth Reclamation Data**

- **Typical Grinding Depth – 6 to 9 inches**
  - **Depths of 12 to 16 inches possible**
- **Production Rates – Average 25 ft/min**
- **Or, 1 to 1.5 lane miles per day**





## Finished Project

- **Improved**
  - **Ride**
  - **Cross Slope**
  - **Structural Capacity**



# Full Depth Reclamation - Conditions for Use

- **Pavement Evaluation – Visual Inspection**
  - **Defects**
    - **Rutting, Cracking, Poor Cross-Slope -Etc.**
  - **Traffic Volume**
    - **Typically low to moderate volume**
  - **Pavement thickness - any**
  - **Lane Width to accommodate equipment**



# Full Depth Reclamation – Candidate Selection





# Full Depth Reclamation – Candidate Selection





## Full Depth Reclamation – Candidate Selection





# Full Depth Reclamation – Candidate Selection





# Full Depth Reclamation – Candidate Selection





# Full Depth Reclamation – Candidate Selection







# Full Depth Reclamation – Candidate Selection





# Full Depth Reclamation – Candidate Selection





# Full Depth Reclamation – Candidate Selection





# Full Depth Reclamation

- Questions?