Aggregate Stockpiling and Handling

IAAP 2019 Convention Education Program
March 6, 2019
“Aggregates 101”

Purpose of Training

• Importance of proper stockpiling
• Handling Material Correctly
• Loading out Correctly
• Asphalt Customers’ Perspective
• Ready Mix Concrete Customers’ Perspective
Stockpiling Aggregates – What Do We Need to Know?

- Contamination
- Degradation
- Segregation
- Load-out
- Consistency
- Affects on customers
Contamination

Contamination is defined as:

The introduction of extraneous aterial (normally deleterious) into a finished aggregate
Contamination by Tracking Mud and Clay on to Pile
Contamination by Digging into Stockpile Pad or Dumping Clean-up on Side of Pile
Contamination

- Floor (oversize or fines)
- Housekeeping – road materials
- Adjacent Stockpiles
  - If not separated
- Multi-tasking
- Loading multiple products, overloads
Contamination

• **DO**
  - Use conveyors so foreign material isn’t introduced by other equipment
  - Minimize inventory buffer – time increases chance for foreign material to overtake stockpile

• **DON’T**
  - Drive equipment on stockpile
  - Handle material more than once
Degradation is defined as “The actual breakdown of individual aggregate particles due to abrasion and attrition during stockpiling and handling”

Can be detrimental to the final product due to the increased minus #200 material (fines)

Increased fines cause performance problems in the final products
Degradation
Degradation is defined as “The actual breakdown of individual aggregate particles due to abrasion and attrition during stockpiling and handling.”

Breakdown can change gradation significantly.

Change in gradation could affect customer use OR make material OUT OF SPEC.
Managing Degradation

Recognize degradation in ramps or benches

Minimize areas for ramps or driving on piles

When possible blend degraded material with coarser material

If degraded material doesn’t look right – too fine, e.g. - Call QC or supervision
Segregation – What is it?

- The separation of a well graded production aggregate into individual sizes due to gravity.
Segregation

• **DO**
  • Minimize drop height to limit overrun (variable height conveyors)
  • Use telescoping conveyor and build in windrows
  • Load from end of pile

• **DON’T**
  • Build stockpile with fixed height conveyors
  • Build stockpiles with trucks, loaders or dozers
Segregation - Stacker Conveyor
Segregation - Size and Shape

- Size ranges
  - Coarse
  - Midrange
  - Fine (sand)

- Texture
  - Smooth surface
  - Rough surface

- Shape
Segregation

- Size and Mass
- Destroys blend
- Settling
- Erosion
Segregation - Casting Distance

- Casting segregates material
- Drop distances
- Stockpile shapes
Segregation

Distance = Segregation

• Distance from
  • truck to ground
  • conveyor to pile
  • bucket to truck

• Keep your
  • conveyor low
  • bucket low
  • dump slow
Segregation – Problems it Causes

- Mix characteristics
- Control at aggregate & HMA plant
- Roadway
  - Structural integrity
  - Stripping potential
  - Raveling
  - Drainage
Know Stockpile Construction

• Conical
  • most re-blending
• Windrow lifts
  • Least re-blending
• Layered
  • some re-blending
Stockpiles

Know Stockpile Shapes

- Cone
- Trapezoid
  - Simple layer
- Windrow layer
You’ve got to be kidding?

The 3 step process- Really?
Truck Stockpiling Methods
Truck Stockpiling Method

- The piles built as single or multi layer
- A layer can be pushed up by loaders
- 2nd most common method
- Material should not be placed closer than 2’-4’ to the layer’s edge

Avoid dropping over edge
Cone stockpile
An adjustable radial stacker moves horizontally and vertically as the material is produced.
Beginning of an elongated cone stockpile with a radial stacker
Radial Stockpile

- Easy pile to build
- Must have axle system to allow movement radially
- Feed point is stationary
- Simple way of increasing volume with the same feed point
- Increases live storage
- Most consistent product to load out
## Types of Stockpiling

<table>
<thead>
<tr>
<th>Stockpiling Method</th>
<th>Stockpile Capacity</th>
<th>Capital Cost</th>
<th>Cost/ton</th>
<th>Degradation</th>
<th>Contamination</th>
<th>Segregation</th>
<th>Compaction</th>
<th>Air Quality</th>
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<tbody>
<tr>
<td>Radial Stacker</td>
<td>Poor</td>
<td>Fair</td>
<td>Excellent</td>
<td>Poor</td>
<td>Fair</td>
<td>Excellent</td>
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<td>Stacker</td>
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<td>Excellent</td>
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<td>Fair</td>
<td>Excellent</td>
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<tr>
<td>Tripper/Longitudinal</td>
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<tr>
<td>Hoppers/Bins/Silos</td>
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<td>Excellent</td>
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<tr>
<td>Dozers</td>
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<table>
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<tr>
<th>Reclaiming Method</th>
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<tbody>
<tr>
<td>Tunnel Reclaim</td>
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<td>Dozer Trap Reclaim</td>
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<td>Fair</td>
<td>Excellent</td>
<td>Poor</td>
<td>Fair</td>
</tr>
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Who is our customer?
Who can make a GREAT first impression?
Who interacts most with them at the quarry?
Successful Loader Operations

Loader Techniques

• Know stockpile construction

• Loading point

• Working the face
Successful Loader Operations

Stockpiling / Moving Piles

• Re-blend as you move
• Work the face of pile as if loading customer truck
• Stack as high as loader will reach
• Avoid ramping whenever possible (especially Fix plant customer stone)
• Do not cast over the side, this promotes segregation
• If ramping unavoidable, load ramped material for commercial uses (under slab, drainage fill, etc)
Successful Loader Operations

• Asphalt and Concrete – Fixed Customers
WHY CONSISTENCY?

• Asphalt mixes are 95% aggregate...
• Concrete is about 85% aggregate...
• Properties of asphalt and concrete mixes are based on the properties of the aggregate...
• Changes in the aggregate properties will cause changes in the asphalt and concrete mix properties...
• Customer may get penalized...
• Performance does not meet expectations...
• Materials will prematurely fail!
Loading Point

• Load from end perpendicular to belt
• Re-blend as you load
• Approach straight
  • fine
  • medium
  • coarse
Successful Loader Operations

Entering the Face

• Work upward
  • Do not scrape ground in front of pile
  • Wet
  • Contamination

• Split the seams
  • rotate up
  • back out
Successful Loader Operations

Working the Face

• Move across face
  • Perpendicular to conveyor
  • Less segregation
  • better mix
    • fine
    • medium
    • coarse
• Avoid deep penetration
Successful Loader Operations

Questions?