

# **Arizona Pavements/Materials Conference**

**A.S.U.**

**November 16-17, 2022**

**Asphalt Pavement Recycling**

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# What is In-Place Recycling?

- ▶ In-Place recycling is an on-site, in-place method that rehabilitates deteriorated asphalt pavements and minimizes the use of new materials.

# Asphalt Pavement Recycling

## Application and Construction

- ▶ What is In-Place Recycling?
- ▶ Preventive Maintenance
- ▶ Cold-In-Place Recycling
- ▶ Full Depth Reclamation
- ▶ Preventive Maintenance
- ▶ Hot-In-Place Recycling
  - HIR Benefits - Considerations
  - Types of HIR
  - Project Considerations

# Cold-In-Place Recycling

- ▶ CIR is a pavement maintenance/rehabilitation technique that involves the processing and treatment of the existing asphalt pavement with a bituminous recycling agent (emulsified asphalt or foamed asphalt) and additives, as required, such as lime, cement, or corrective aggregate.

# CIR Construction Process

- ▶ Existing asphalt is milled to a specified depth - usually 3-4”.
- ▶ Milled material is conveyed to screen deck.
- ▶ Oversized material is sent to hammermill crusher.
- ▶ 100% of material passes top size requirement (1 1/4” minus).
- ▶ Processed material is sent to pugmill.
- ▶ As material is conveyed to pugmill, it crosses over belt scale.
- ▶ Electronic signal tells the “brain” how much material is entering pugmill and injects proper amount of additive.



# CIR Laydown

- ▶ Once the material is mixed in pugmill, it is deposited in a windrow.
- ▶ The windrow elevator picks up the windrow and deposits it in the paver hopper.
- ▶ Once the material is laid, compaction of the mat commences within 30 minutes or so depending on weather conditions and curing process.



# Full Depth Reclamation

- ▶ An engineered pavement recycling process in which existing pavement materials are incorporated into a structural pavement section through the pulverization and/or soil stabilization process.



# Full Depth Reclamation

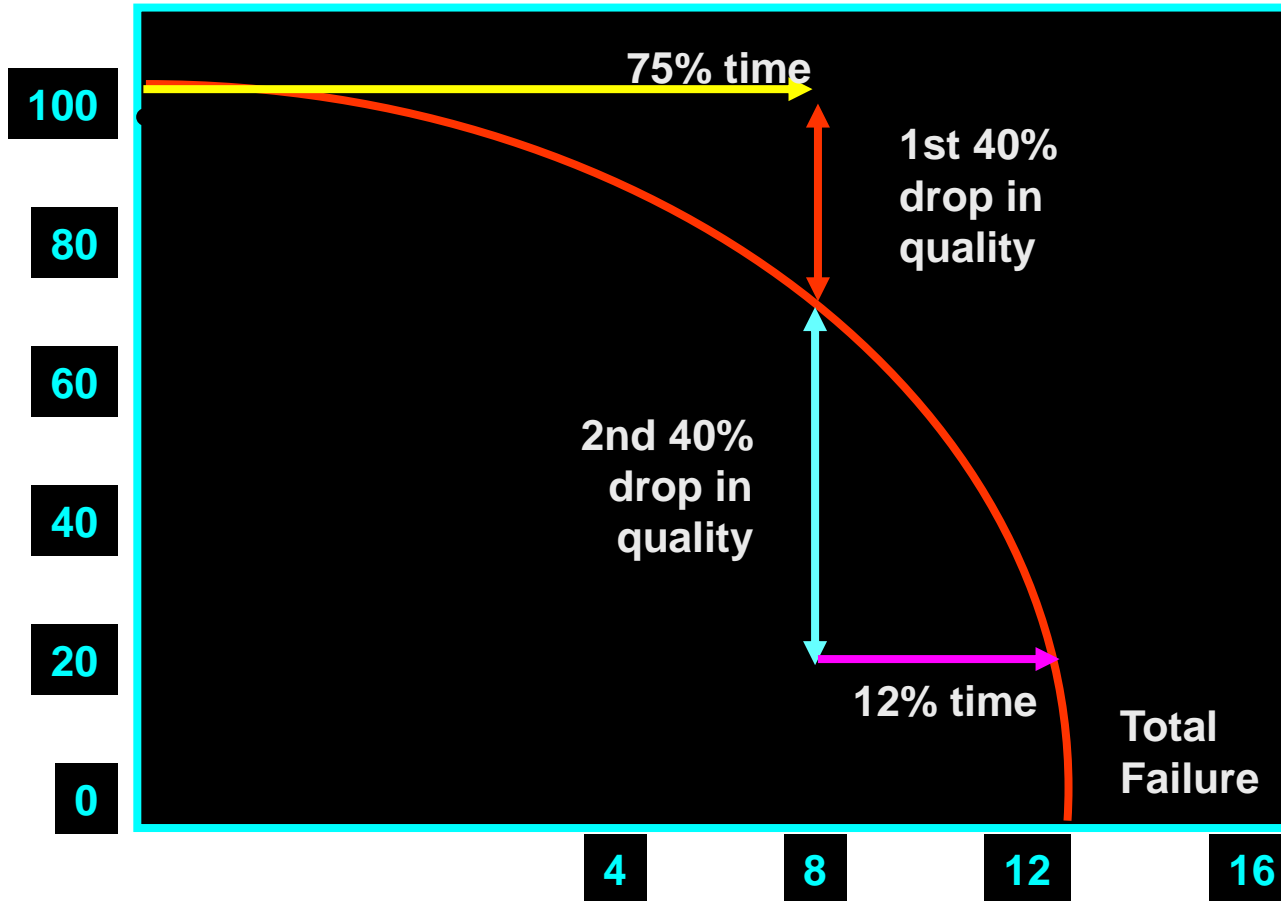
- ▶ Typical depth of 6-12 inches - most of today's pulverizers can achieve 16-18" in depth.
- ▶ Additives used are cement, lime slurry, emulsion, and foamed asphalt.
- ▶ Surface Treatments range from a chip seal to HMA overlay.





# Preventive Maintenance

Pavement Condition



Years (Time Varies for each Road Section)

Each \$1 spent during the first 40% drop in quality will cost \$4-5 if delayed until pavement loses 80% of its original quality.

# Hot In-Place Recycling

- ▶ HIR may be performed as either a single pass (one phase) operation that monolithically recombines the restored pavement with virgin material, or as a two pass procedure, where the restored material is recompact and the application of the new wearing surface then follows.

# Hot In-Place Recycling

The following improvements are dependent on the type of HIR method used. (there are 3 types)

- ▶ Can treat surface to a depth of  $\frac{3}{4}$  inch up to 3 inches
- ▶ Can add additional AC binder/modifiers/Recycling agent
- ▶ Can add additional hot mix asphalt/virgin aggregate

# Hot In-Place Recycling Benefits



- ▶ Repairs Distress
- ▶ Extends Life
- ▶ Improves Ride Quality
- ▶ Improves Friction Coefficient
- ▶ Improved Bonding
- ▶ Work completed in a single pass (Repaving)
- ▶ Maximize the return on investment

# Hot In-Place Recycling Considerations

- ▶ Surface Asphalt Conditions are most important
- ▶ Ruts, Shoves & Bumps
- ▶ Patches & Utility Cuts
- ▶ Crack size and Condition
- ▶ Weathering, Bleeding & Raveling
- ▶ Pavement Geometry
- ▶ Existing AC thickness
- ▶ Geotextile fabrics
- ▶ Curb and Gutter
- ▶ Subgrade condition
- ▶ Pavement final elevation



# Types of HIR

- ▶ Surface Recycling
- ▶ Remixing
- ▶ Repaving



# Repaving

Combines the Surface Recycling or Remixing process with the placement of a simultaneous or integral overlay of new HMA while the temperature of the recycled layer is 200° F minimum. (Recycle depth 1"-2")



# Repaving





# Repaving



# Repaving



# Repaving

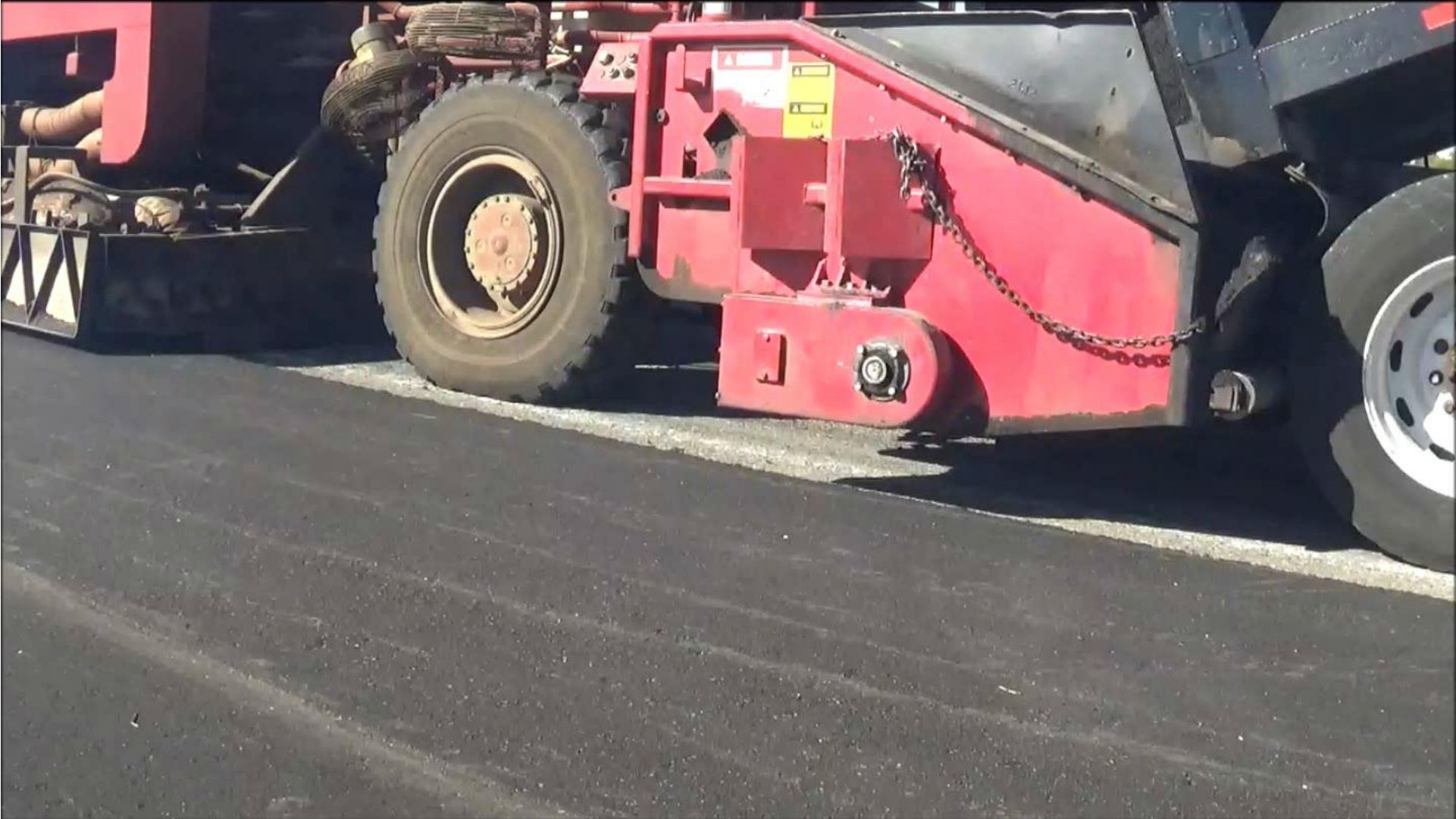


# Repaving



# Repaving







- Asphalt Pavement Recycling

Successes & Failures?

Developments

- Higher Binder Content in Overlay
- Various Wearing Courses
- Recycle Surface Treatments (Seals)
- Repave Wider Widths
- Environmental Product Declarations (EPDs)



# Questions?

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