
Innovative Methodologies
for Road Surface Maintenance in Japan;
HIR (Hot In-place Recycling),
Hot In-place Thin Overlay and
Hot In-place Transforming

National Conference on Highways Construction Technology

at Hyderabad

July 15, 2016



HIR Target Work Fields (Red-Framed)

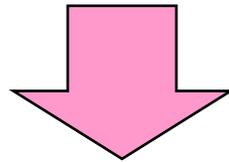
Pavement Preservation Guidelines

	Type of Activity	Increase Capacity	Increase Strength	Reduce Aging	Restore Serviceability
	New Construction	○	○	○	○
	Reconstruction	○	○	○	○
	Major (Heavy) Rehabilitation		○	○	○
	Structural Overlay		○	○	○
	Minor (Light) Rehabilitation			○	○
Pavement Preservation	Preventive Maintenance			○	○
	Routine Maintenance				○
	Corrective (Reactive) Maintenance				○
	Catastrophic Maintenance				○

Table Source : US FHWA

Hot In-place Recycling

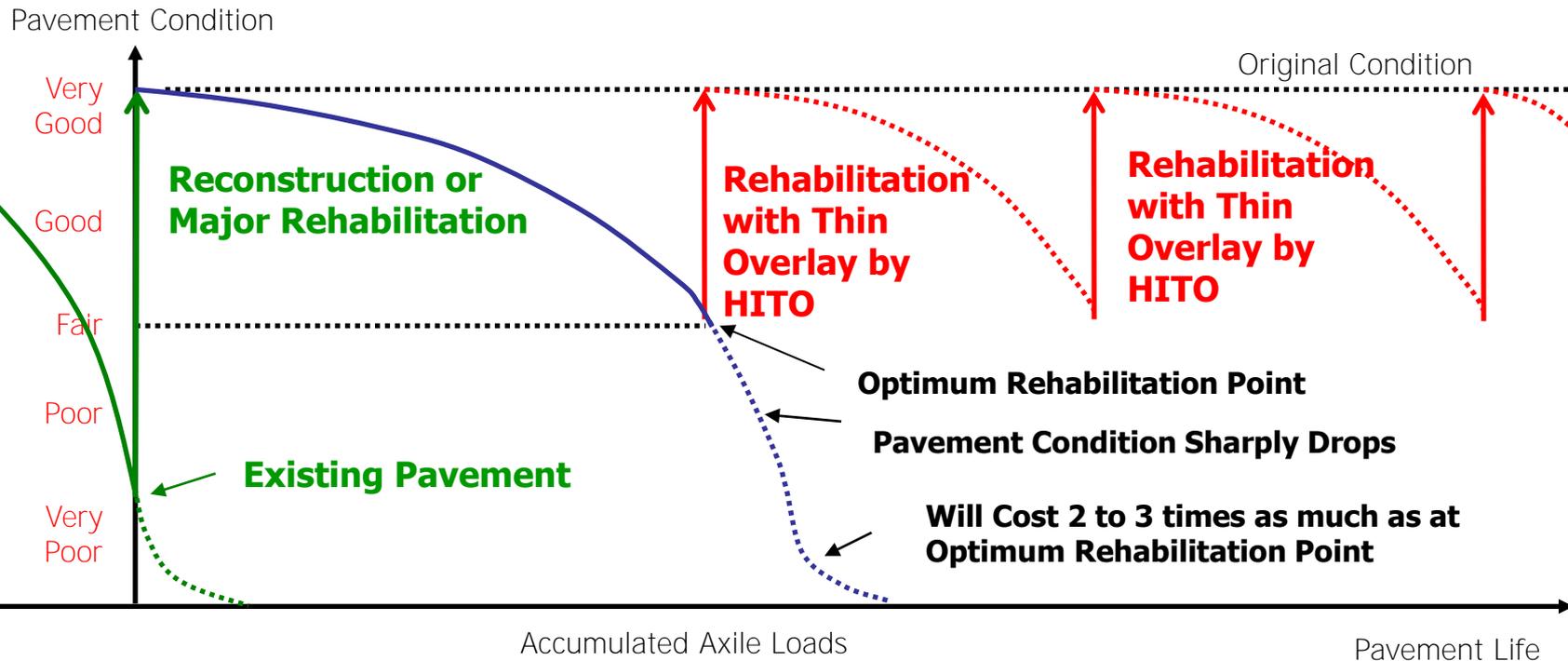
- Economics Including Construction Cost & Long Life
- Resource Saving
- Safety Improvement
- CO₂ Emission Reduction



Innovative Method beyond the Conventional Method

Pavement Management System for Sustainable Road Construction

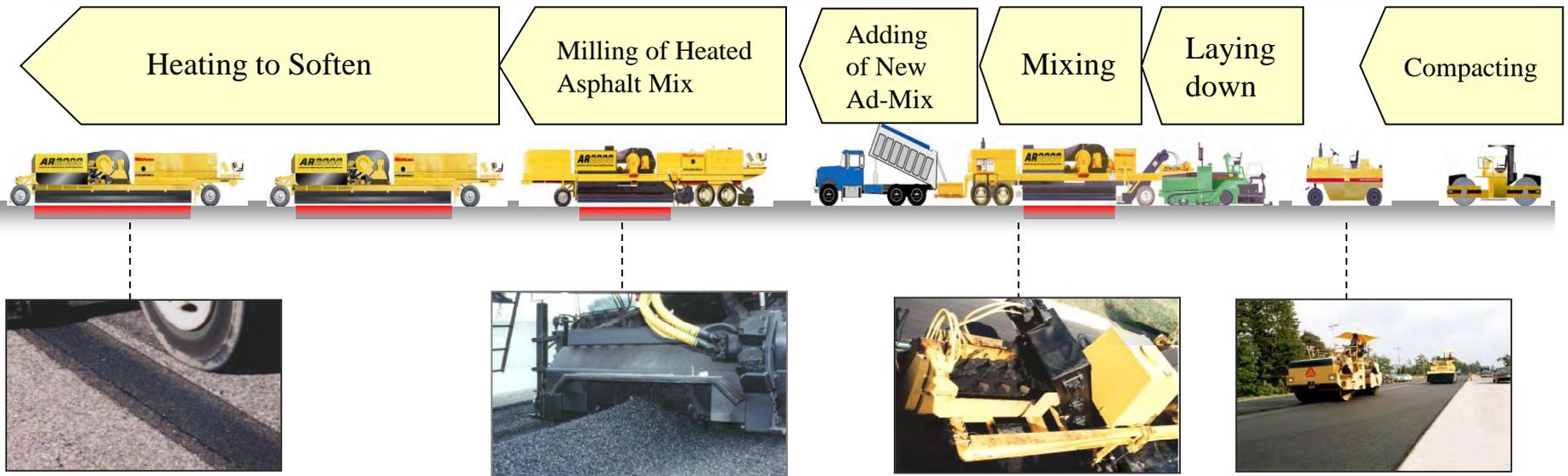
Pavement Life-Cycle Prolongation through Keeping Condition Approach



Features of asphalt mixture; Recyclable,

Easily softened by heater at 60 to 80 °C with aggregates not damaged.

What is HIR?



Resource Saving

Reuse 100% of existing asphalt mixture (Usually 70% reduction of new asphalt mixture compared with conventional method)

Environment

No smell, no smoke, no fire under usual operation
Reduction of CO2 emission (40% reduction compared with conventional Mill & Fill method)

Work Speed

5m/min on average

Economics

More economical than prevailing conventional Mill & Fill method

Why HIR Preferred?

Re-habilitation Method		HIR	Mill & Fill	CIR	Mico Surfacing (Slurry Seals)	
Type of Pavement Distress	Rutting	○	○	○	△	
	Unevenness (Corrugation)	○	○	-	×	
	Cracking	Alligator	○ *	○ *	○	×
		Longitudinal	○	○	○	×
		Transverse	○	○	○	×
	Raveling	○	○	-	○	
	Bleeding	○	○	-	△	
	Slipperiness	○	○	-	○	
Characteristics	Existing Asphalt Mixture	Loosening	Hard Milling or Excavation	Hard Milling	-	
	Aggregate in Use	<u>Not Crushed</u>	<u>Crushed and Disposed</u>	<u>Crushed</u>	-	
		<u>100% Onsite Reuse</u>	<u>Replace</u>	<u>100% Onsite Reuse</u>	-	
	Mixture Gradation	<u>Unchanged</u>	-	<u>Changed</u>	-	
	Pre-Treatment Under Layer	<u>Not Required</u>	Tack Coat	Cleaning and Tack Coat	Cleaning and Tack Coat	
Transport Reclaimed Materials to Plant	<u>Not Required</u>	By Truck	Not Required	Not Required		

*: △ depending on the damaged condition

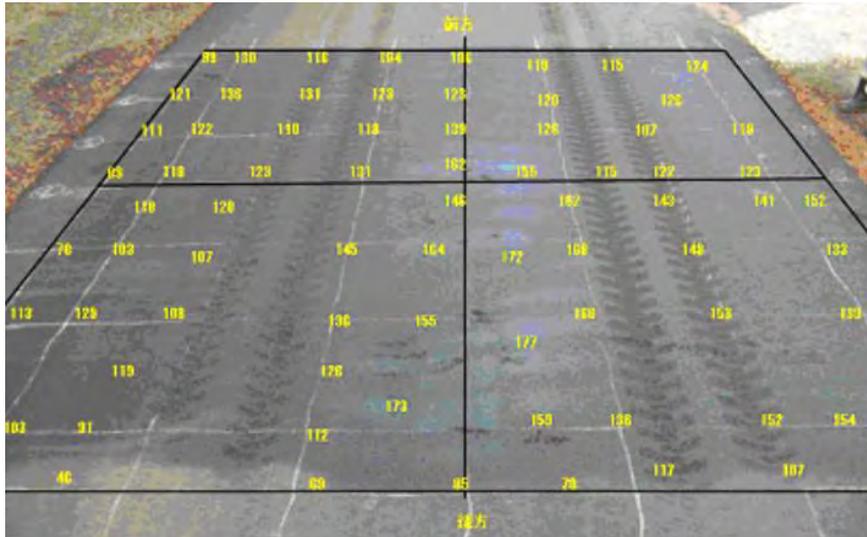
○ Suitable × Unsuitable - Usually not used

Superb Hot Air Heating System developed by Green ARM

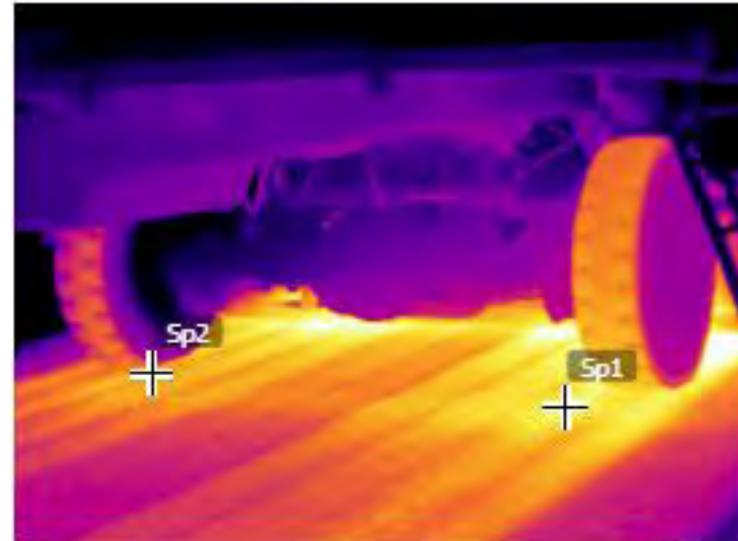


HEATER (Green ARM's Heater)
(Patent No. JP 4024293)

Hot Air Heating System;
Easy Supply of Fuel on Site for Surface Heating,
Diesel: Much Safer Fuel than Propane,
Hot Air Heating; Gentle and Even Heating,
Step-less Adjustment of Heating Width



Surface Temperature after Heating

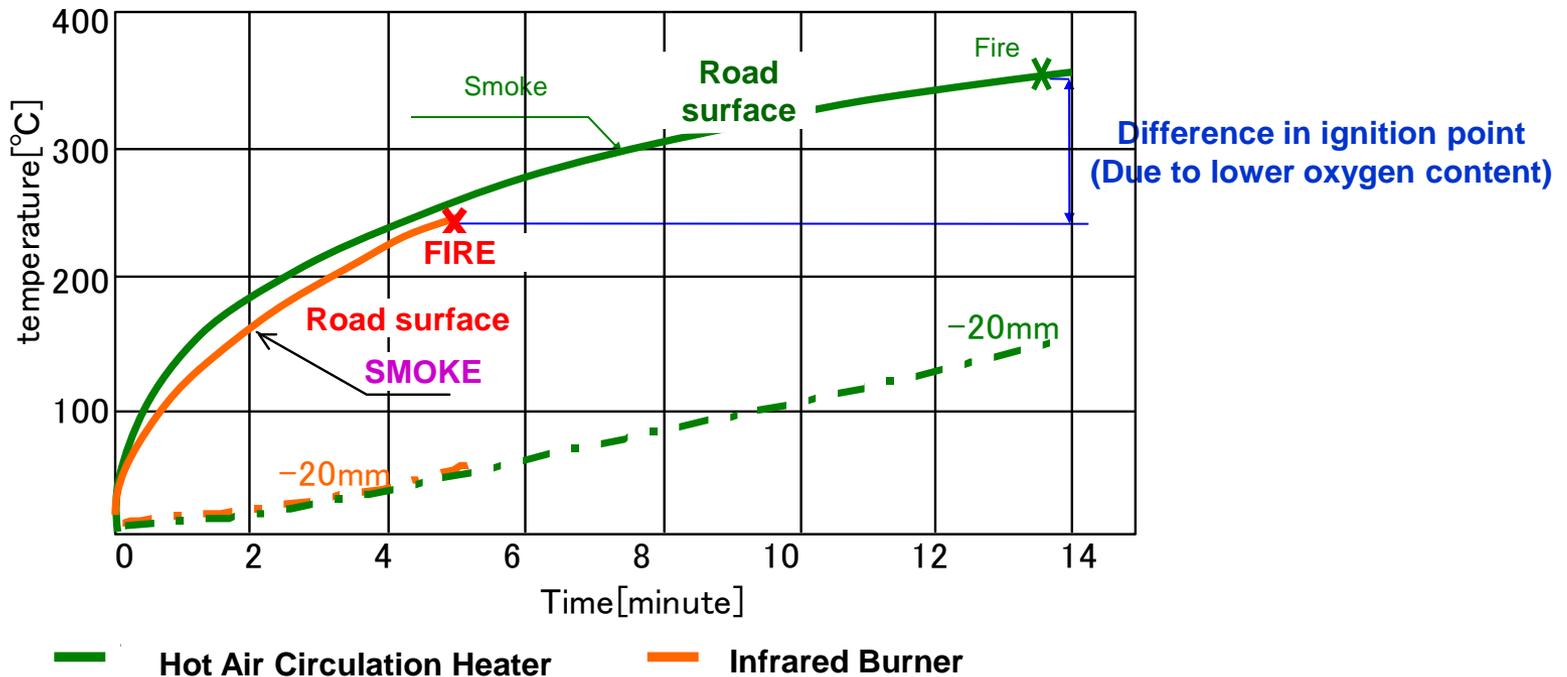


Heating

Advantages with Hot Air Circulation Heater

1. Gentle Heating; No Overheating of Road Surface.
2. Homogeneous Heating of Road Surface.
3. No Smoke, No Fire, No Odor.

The performance has been confirmed through road heating work in Japan and California, US.

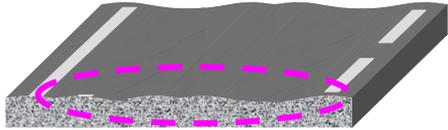


Hot In-place Thin Overlay

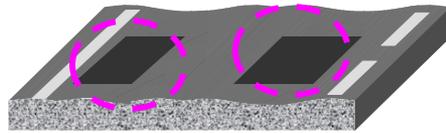


Hot In-place Thin Overlay; New Easy Preservation Method

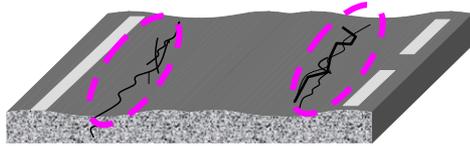
Light Distress



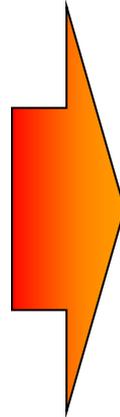
Rutting



Patching



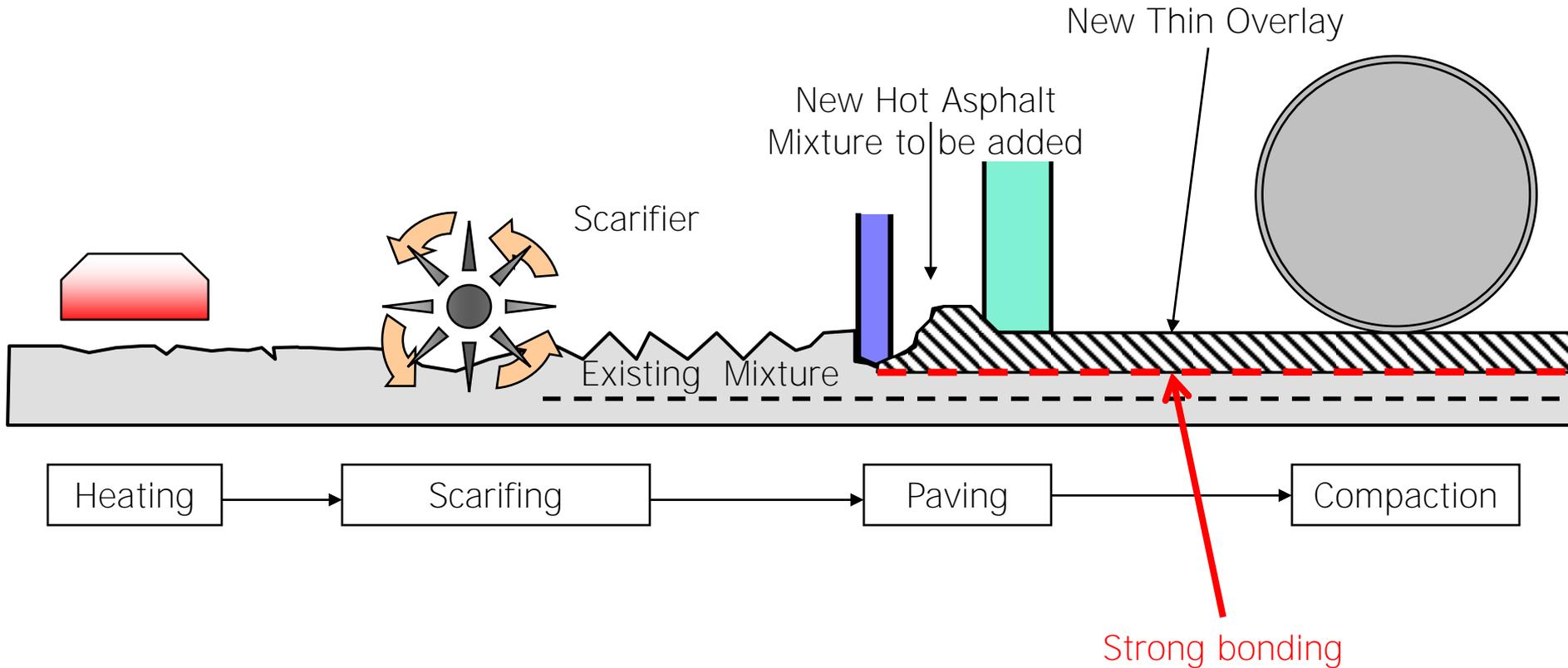
Crack



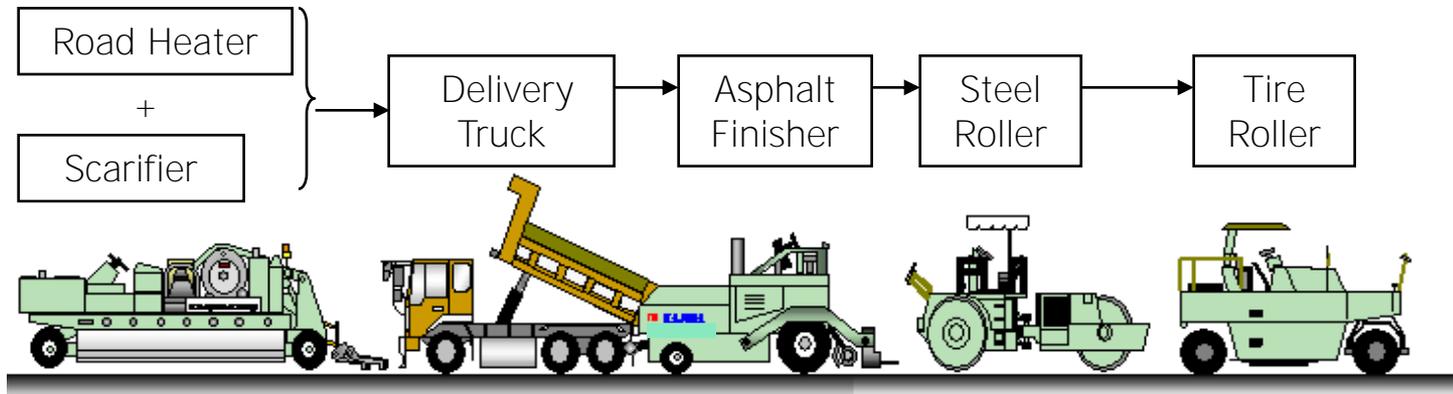
Structural Profile



Method of Hot In-place Thin Overlay (HITO)

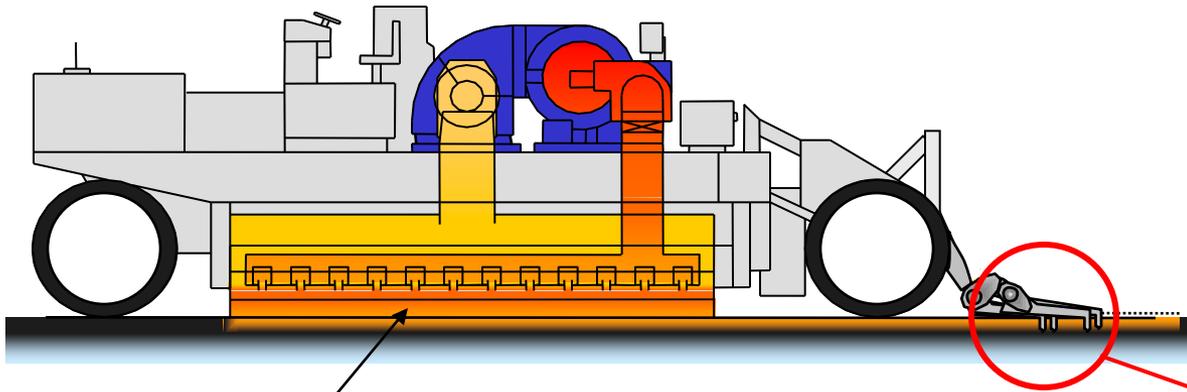


HITO Method



- Simple Repavement
- Short Train Composites
- Good Performance

Key Technology of HITO



Hot Air Circulation



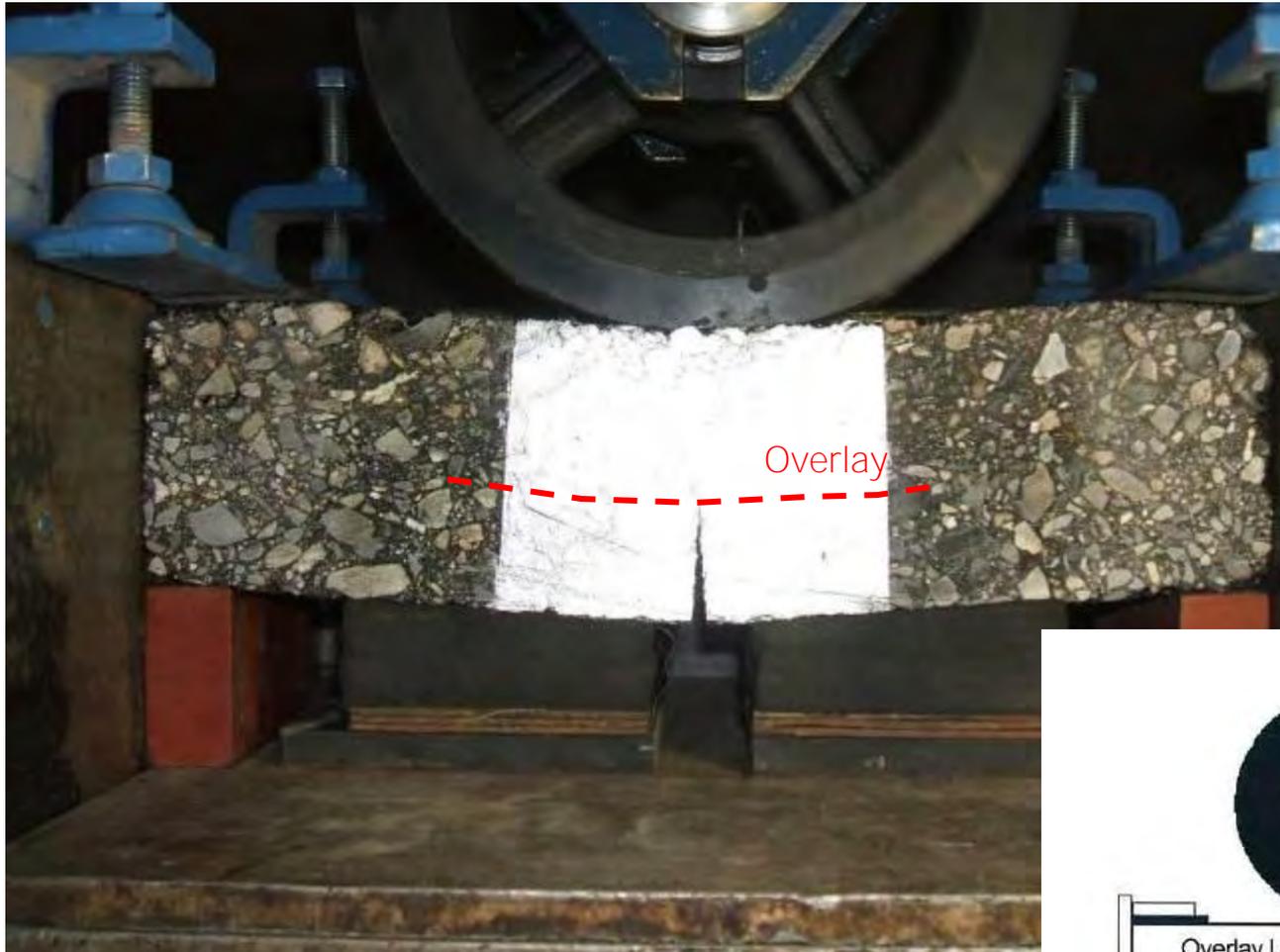
Characteristic Features of HITO Method

Simple Work;

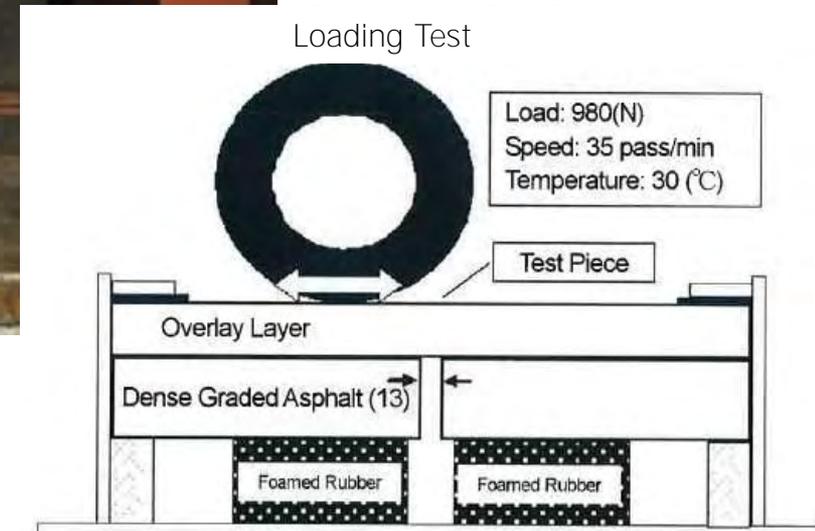
1. Combination of Efficient Heater & Conventional Paving Machine
2. Advance Mix Design Work Not Required ;

Ordinary Asphalt Mixture Available in the Market ready to be used for New Hot Asphalt Mixture to be added

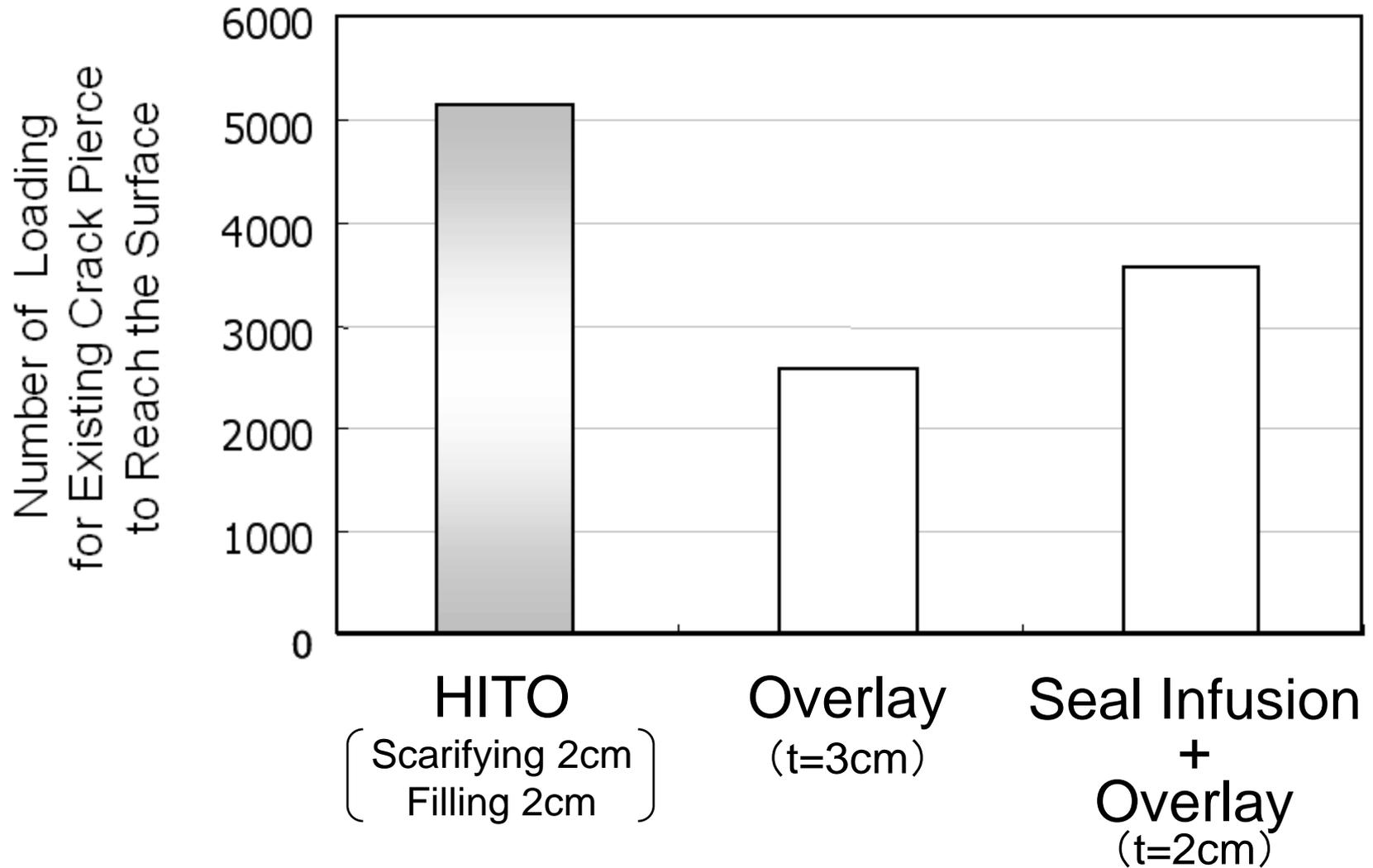
HITO Work; Evaluation of Increase in Strength



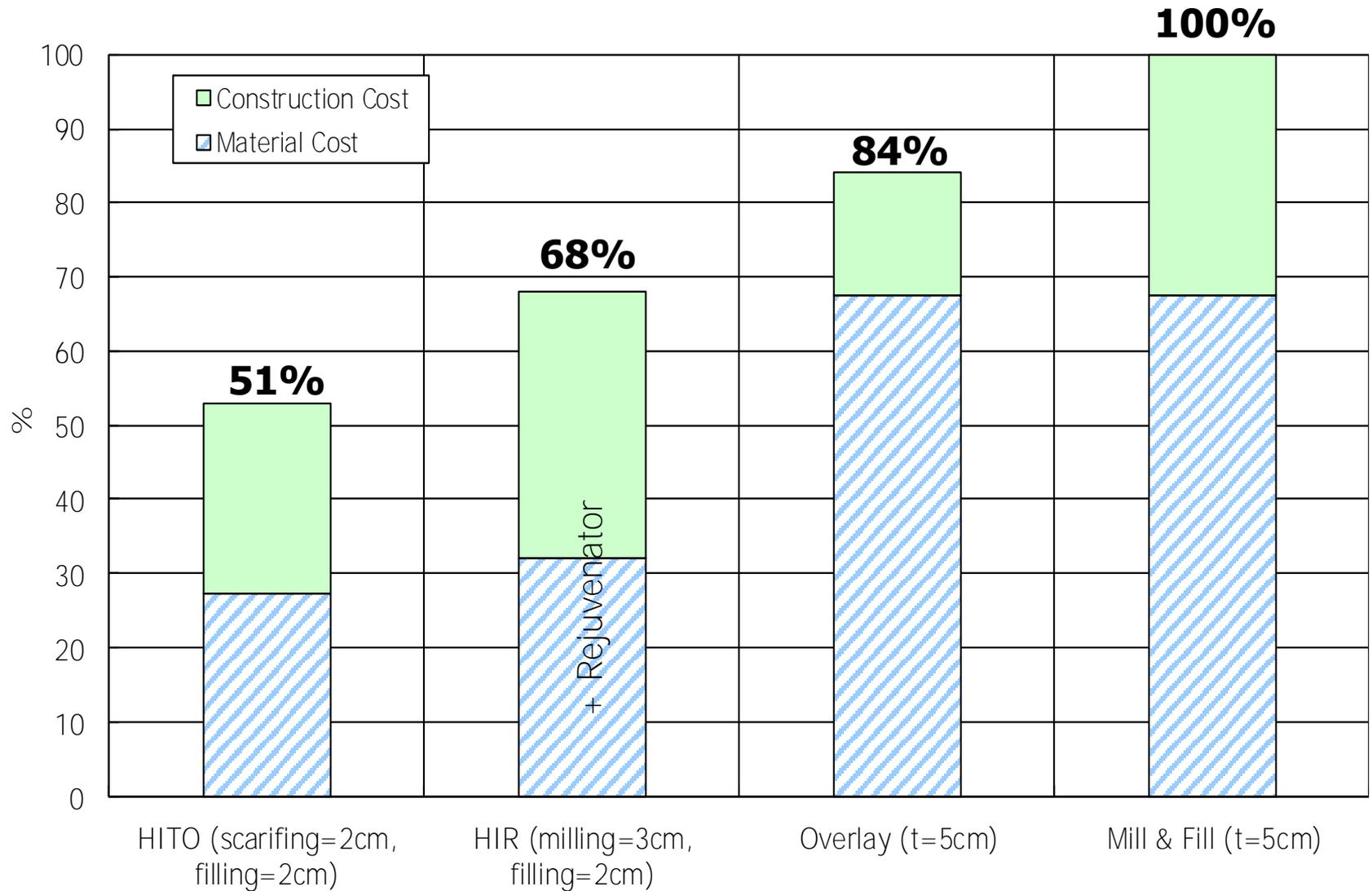
Loading Test
with Wheel Tracking



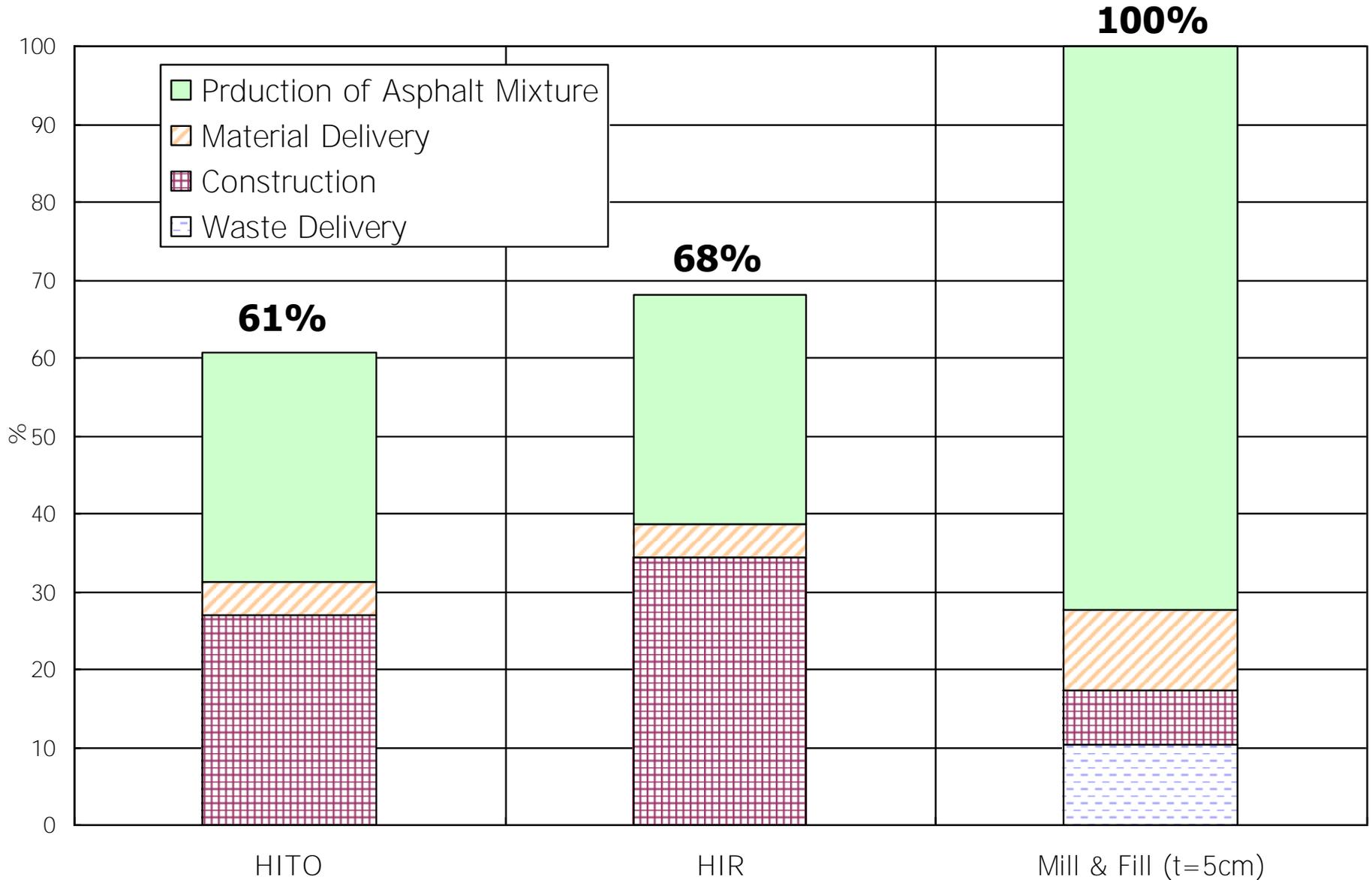
HITO Work; Loading Test Result



HITO Work; Cost Reduction



HITO Work; CO₂ Reduction



HITO Work; Summary

1. Life Extension

- Sound conditions confirmed in more than 3 years

2. Cost Reduction

- 49% Less than Mill & Fill

3. CO₂ Reduction

- 39% Less than Mill & Fill

4. Riding Quality Improvement

- Elimination of Rutting
- Elimination of Cracks

Hot In-place Transforming; Invented by Green ARM and Patented

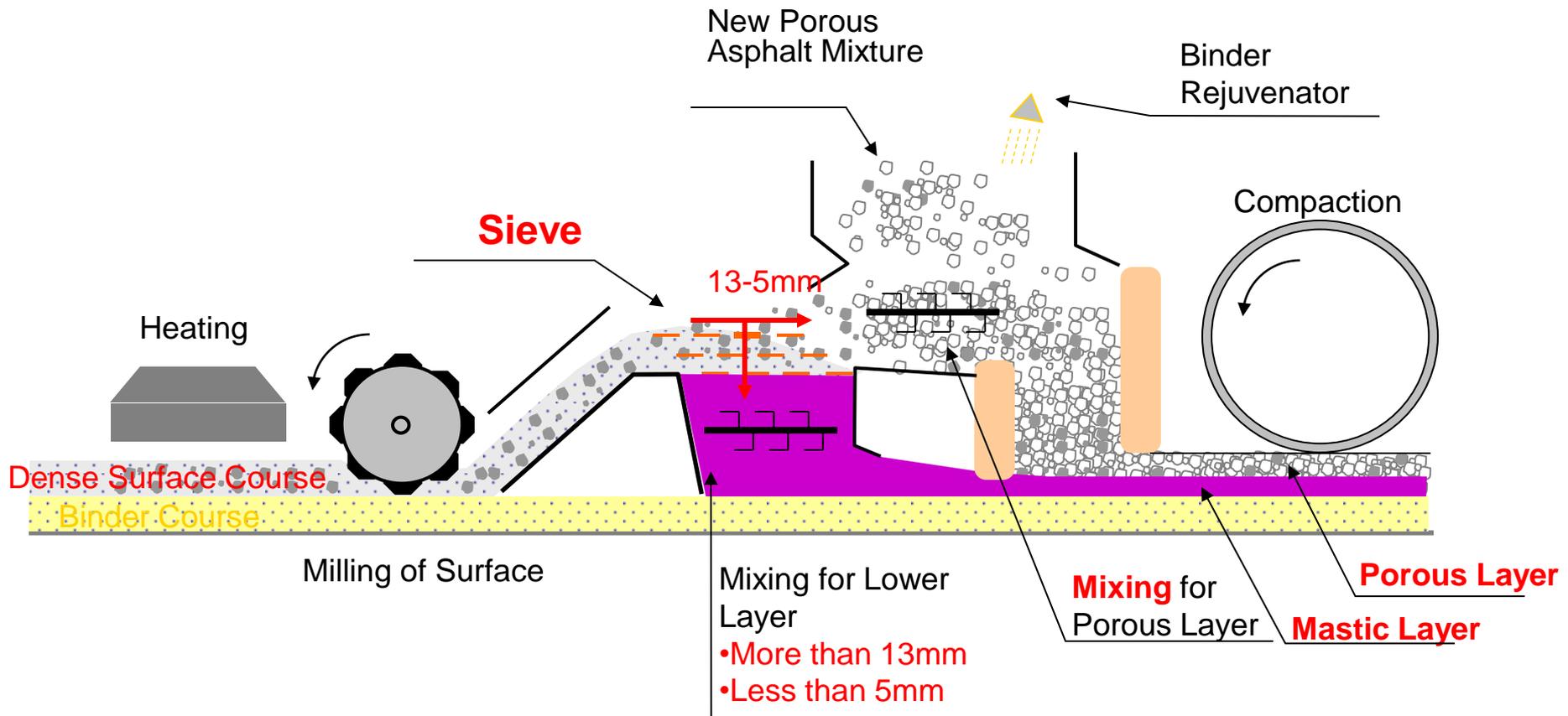


Site

National Highway Route 77 in Okinawa

Hot In-place Transforming (Dense to Porous)

Dense Surface Mixture sieved, then transformed to Porous Mixture and Mastic Mixture on Site by Double-lay Paver



Hot In-place Transforming Work done (Dense to Porous)

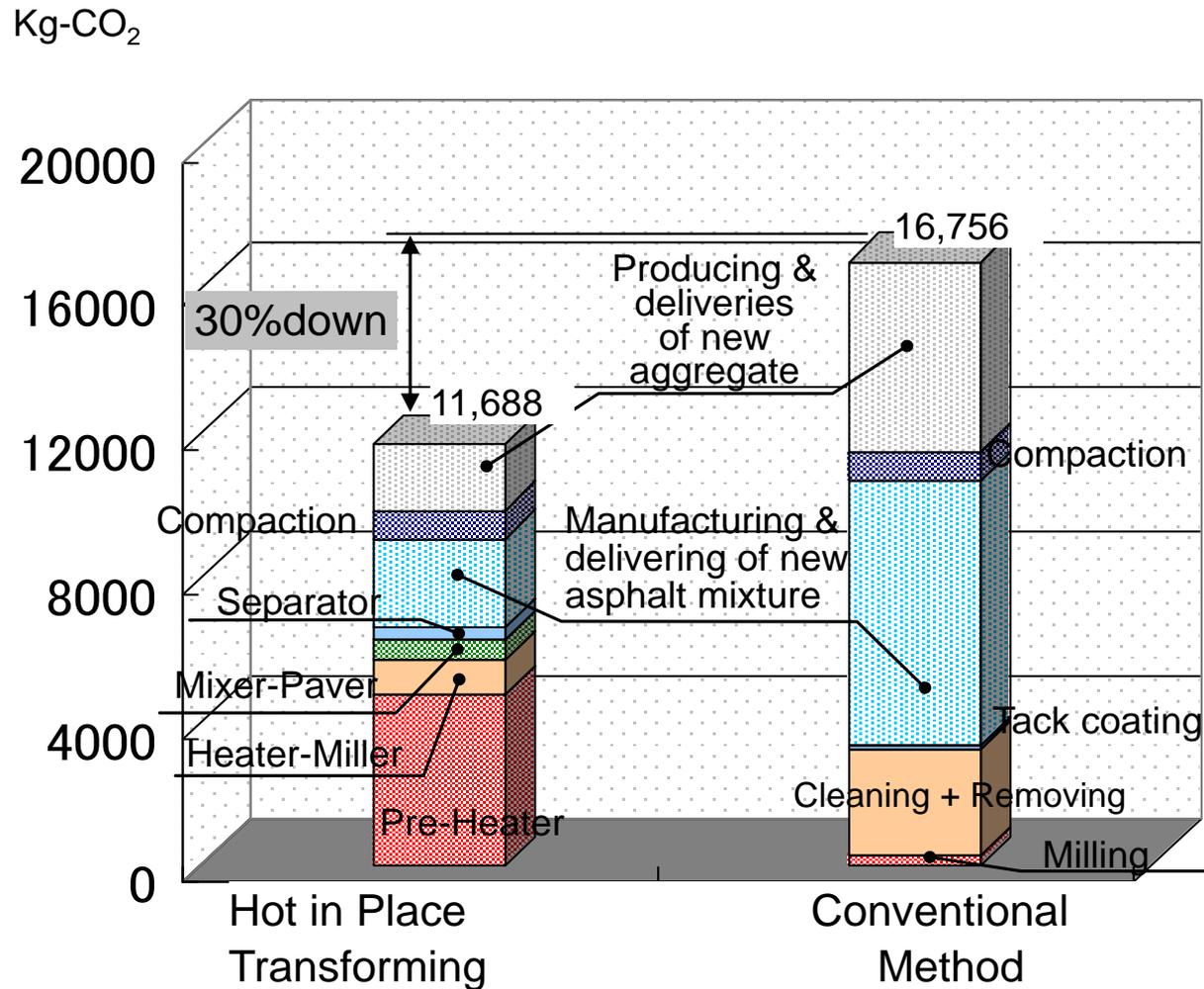
Site; National Highway Route 126 in Chiba prefecture, Japan

Construction Volume; 3,000m² (Length: 400m × 2Lane)

Construction Speed; 2.0m/min



HIT Work; Reduction of CO₂ Emission



Green ARM offers Green and Cost Saving Technologies for Road Surface Maintenance and together with Terpl Private Co., Ltd., India is ready to contribute to Road Infrastructure Improvement in India

Thank you.

To be followed by NICHIREKI, which introduces its bridge life prolongation technology.