



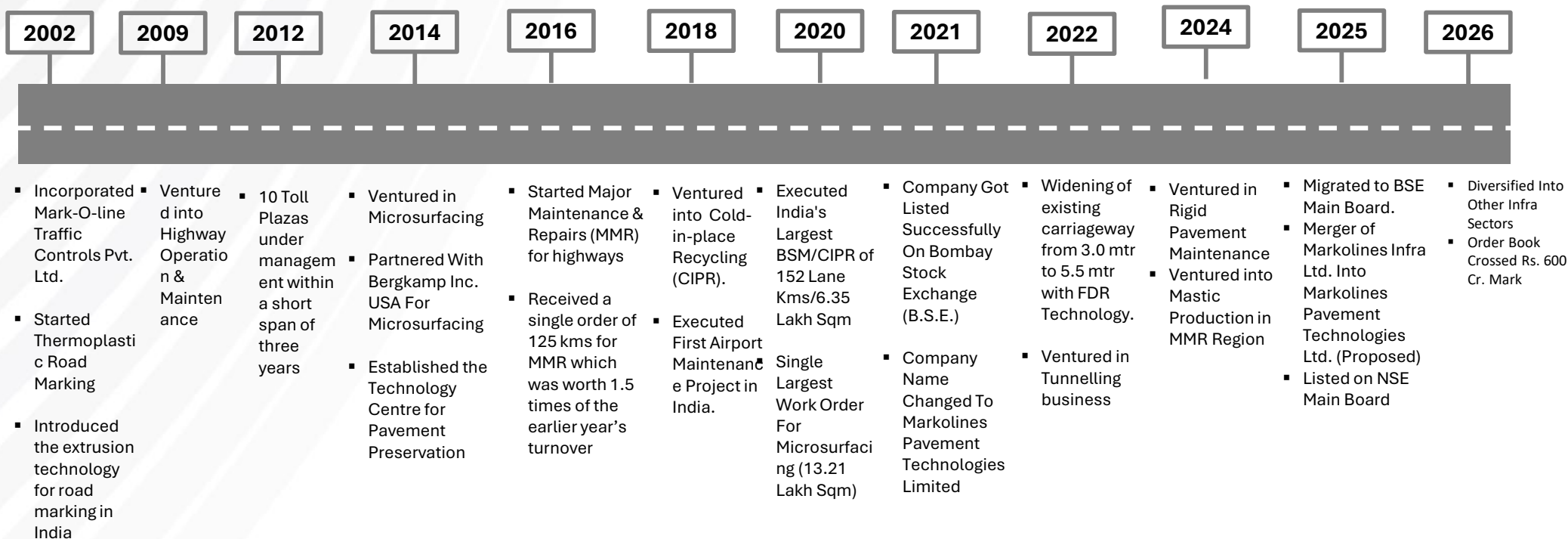
India's Largest Highway Construction & Maintenance Company

**Introduction to our Sustainable Offerings for
Construction of Flexible & Rigid Pavements, Via Ducts,
Tunnels and Rehabilitation of the Roads**

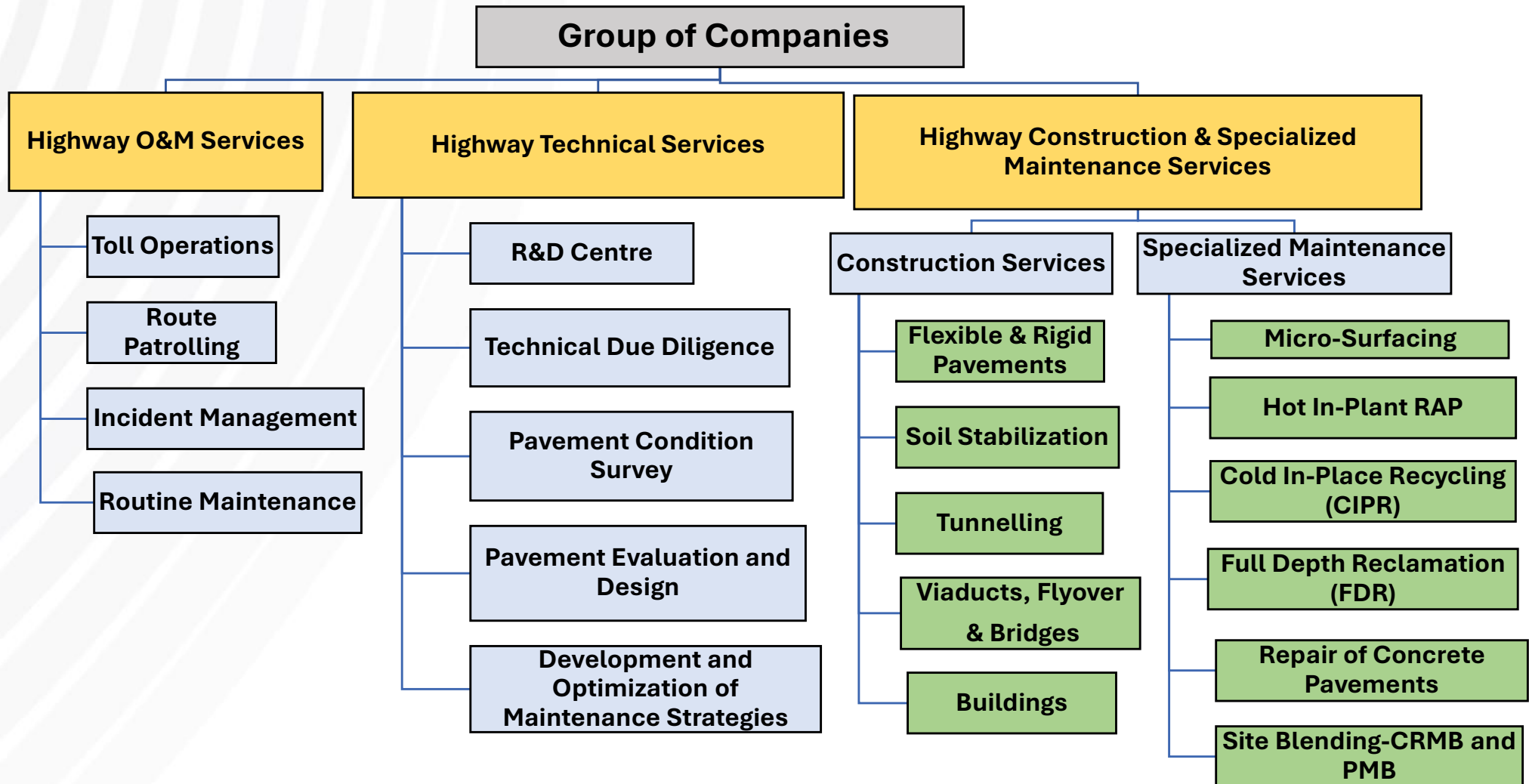
PAVING THE PATH

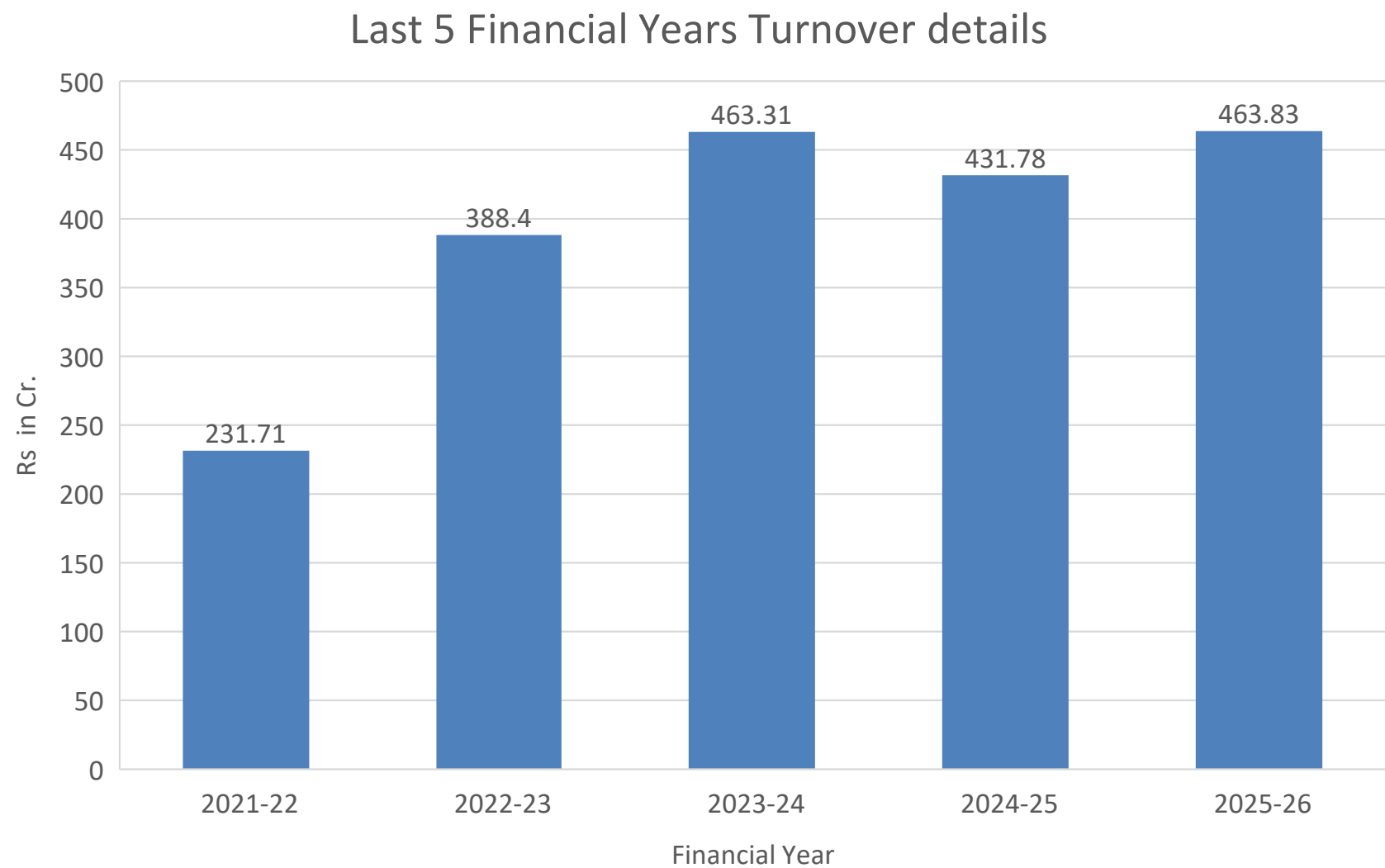
**TOWARDS AN INNOVATIVE FUTURE
USING STATE OF THE ART
TECHNOLOGY.**

MARKOLINES JOURNEY



Our Portfolio







MARKOLINES: AT A GLANCE

- ✓ 128.15 Lakhs Sqm of Micro Surfacing Work in India
- ✓ 5,381 Lane KM MMR Work in India
- ✓ Rs. 617.91 Cr. Unexecuted Order Book (as Mar 2026)
- ✓ 2.54 Lakhs Cum Soil Stabilization (FDR)/CIPR Work in India
- ✓ 197.52 Lane KMs Highest CIPR Experience in India

❖ **Markolines has always been at the forefront in introducing New Sustainable Pavement Construction & Rehabilitation Solutions and Cutting-edge Technologies.**

A footprint of same with some landmark projects is given below

- Thermoplastic striping by Extrusion technology in 2002, hence the name Markolines
- 1st Company in India to introduce Micro-surfacing with Fibers in 2018
- Highly modified Micro-surfacing with Fibers at Ahmedabad Airport's runway in 2018.
- Cold in Situ Recycling with Foam / BSM in 2018 with Cube at JMTPL.
- Largest CIPR project of 197.52 Lane Kms with L&T IDPL in 2021.
- Full Depth Recycling on NH- 3 Dhule Pimpalgaon and Bhiwandi Wada in SH-76,
- Hot in Plant Recycling on Farakka Raiganj, where DBM with RAP at 40% was used and trials conducted with CRRI at 50% /60% RAP in 2023
- Proud to be the first company in India to successfully implement and execute 19 mm NMA SMA with PG 82-10 (H) binder as a wearing course on the Varanasi–Aurangabad section of NH-2 under the VATPL Project.
- Executed second project in India with high performance Epoxy Asphalt on Khambatki Via duct.

As part of circular economy to reduce Greenhouse gases we are planning to introduce Graphene based solutions for Asphalt and Concrete modification. Graphene is upcycled from Carbon and has a Strength 200X of Steel with High flexibility.

Highway Construction Services

Construction of high-quality pavements both Bituminous (Flexible) and Concrete (Rigid) Pavements, engineered to meet diverse traffic loads, climatic conditions, and lifecycle performance requirements.

Markolines delivers high-performance pavement solutions through advanced construction technologies, precision-controlled processes, and strict adherence to IRC / MoRTH specifications.

We deliver fully integrated EPC services including:

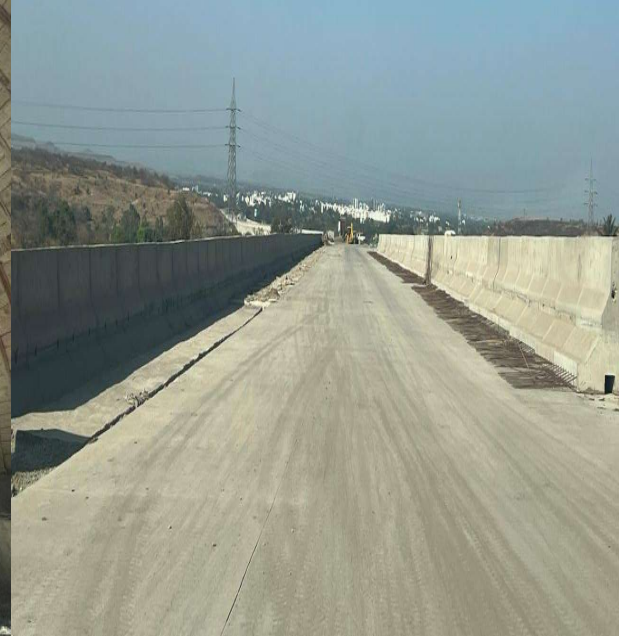
- ✓ Earthwork & Subgrade Preparation
- ✓ Granular Sub-Base (GSB) & Wet Mix Macadam (WMM)
- ✓ Bituminous Base & Wearing Courses (DBM, BC, SMA)
- ✓ Concrete Pavements (PQC / DLC)
- ✓ Drainage & Road Furniture Works
- ✓ Structures : Major/ Minor Bridges /ROB / RUB/ Flyovers/ Viaducts/ Retaining Walls (RCC / Gabion / RE Wall)/ Drainage Structures/Elevated & Special Structures
- ✓ Buildings

Industry Applications:

- National & State Highways
- Expressways
- Urban & Municipal Roads
- Industrial & Port Connectivity Roads
- Toll & Concession Projects

New Twin Tunnel Alignment of Khambatki ghat in Satara Markolines[®]

dist.- NHAI



Construction of Via Duct and Bituminous Treatment with Epoxy Asphalt on Khambatki Tunnel Via Duct- Satara-Pune Section



EPC Project- MSIDCL 16 B Package Dist. Sangli



Ramban Tunnel- TATA Projects in J&K



Various treatments based on pavement condition as per IRC 82-2015, FWD analysis

Flexible Pavement Deterioration Curve

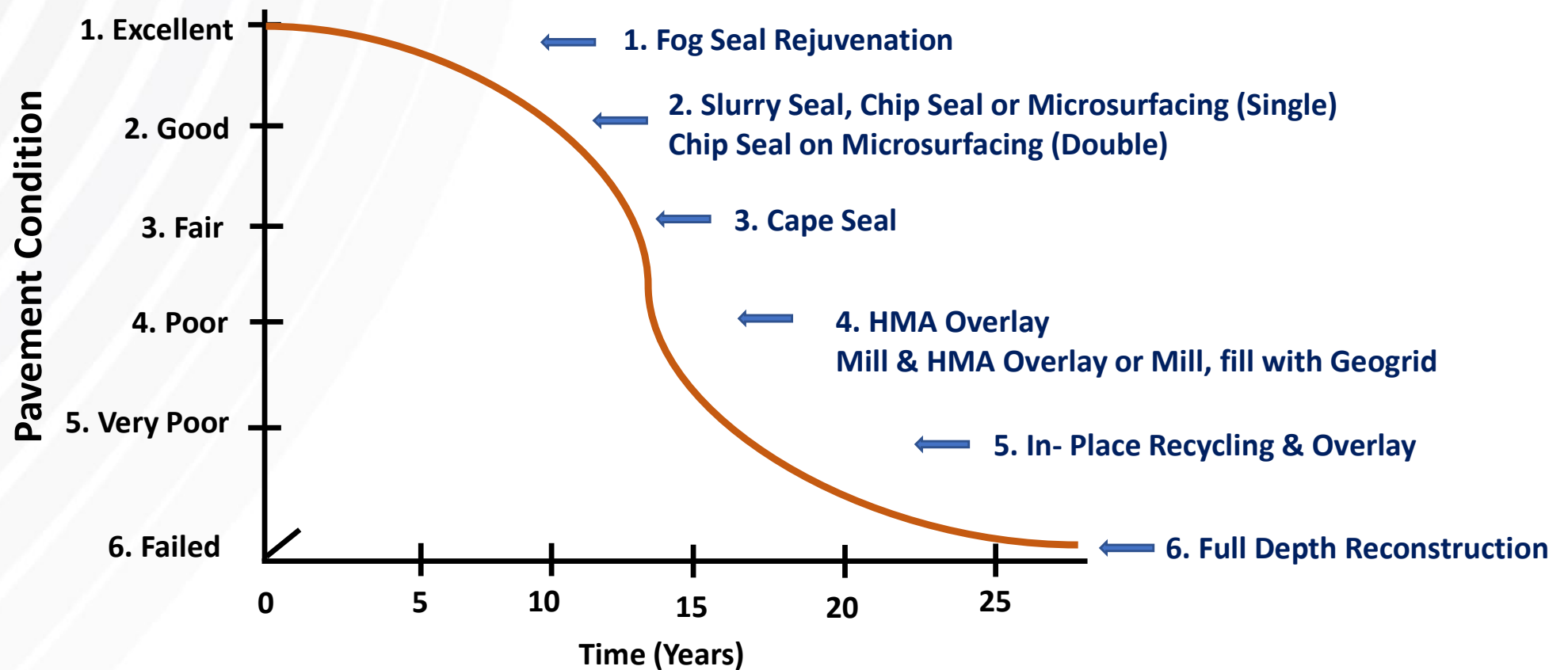
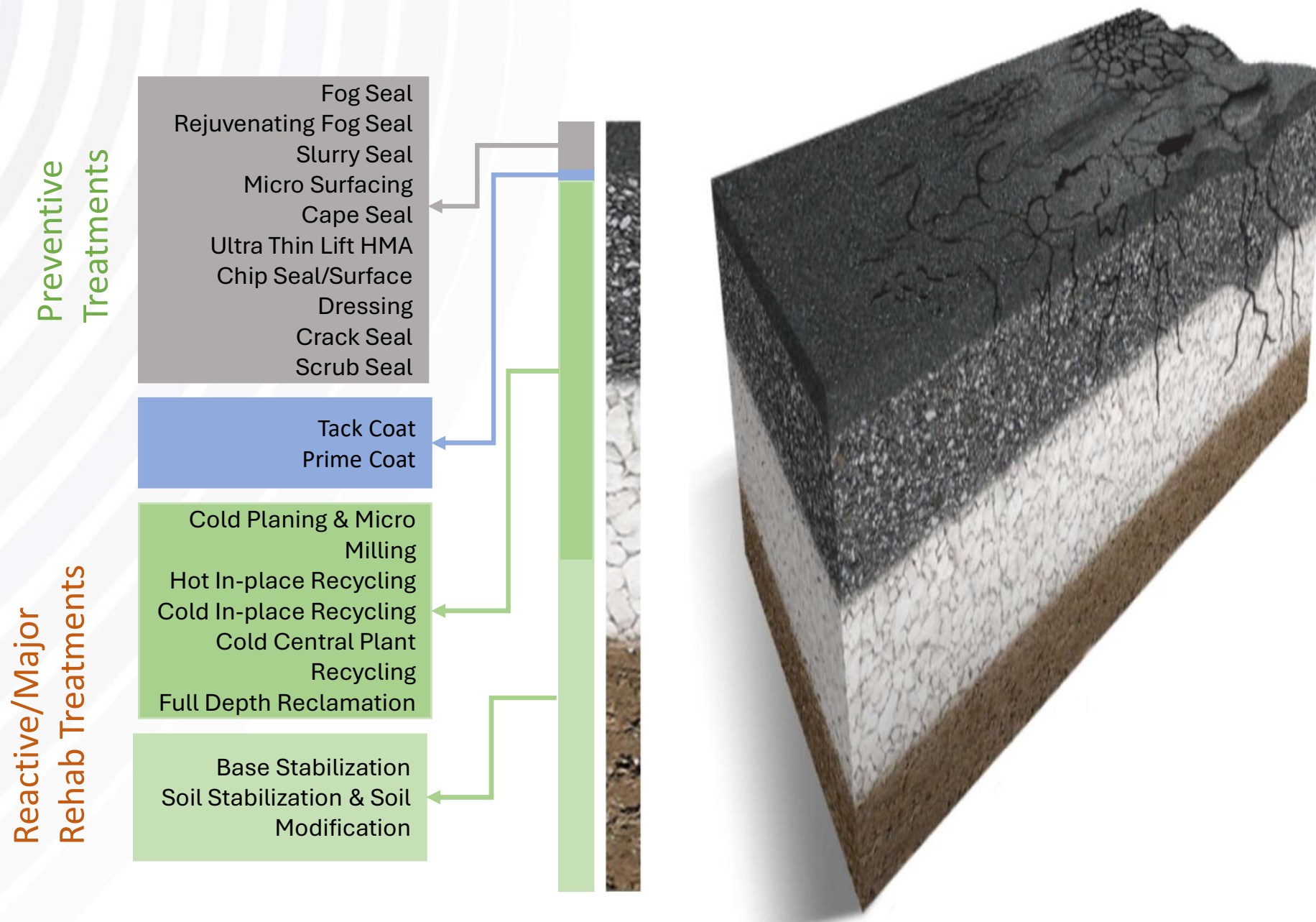


Fig:- Methods of Rehabilitation Based on Pavement Condition

Various potential treatment solutions at varying level of distress



OUR EXPERTISE IN MICROSURFACING



**Executed more than 128.15 LAC
SQM (equivalent to 3600 lane Kms)
of Microsurfacing**



**Technology Centre for pavement
preservation solutions**



**Ownership of
Microsurfacing pavers**



**Tie-up with international
organizations such as
Bergkamp, Ingevity and
Owens Corning for technical
back-up**



**Experienced & Well-Trained
Execution Team**

**Quality of finished Microsurfacing project greatly depends on the quality of
Emulsion and Aggregates..**

INTRODUCTION TO MICROSURFACING- ROADS PRESERVATION TREATMENT

DEFINITION

It is an eco-friendly laboratory-designed mixture of Polymer modified emulsion, premium aggregates, mineral filler, water and other additives accurately proportioned, mixed and uniformly spread over a properly prepared surface

TYPES

Available as Type II (4 to 6 mm thick) and Type III (6 to 8 mm thick).

USES

Can be used both for Preventive Maintenance (to prevent surface distresses on good pavement) and Corrective Maintenance (to correct surface distresses like rutting on older pavement)

APPROVALS

- IRC: SP: 81-2008 : Tentative Specifications for Slurry Seal & Microsurfacing.
- Ministry of Road Transport & Highways (MoRTH – Fifth Edition (2013), Clause – 514)
- IRC:SP:100-2014 : Use of Cold Mix Technology in Construction of Road & Maintenance by Emulsions.
- MoRTH letter dated 28th Sep. 2016 mandating use of Micro Surfacing for renewal course , maintenance and repair on National Highways

MICROSURFACING MIX DESIGN

Particulars	Type II 4 – 6 mm	Type III 6 – 8 mm
Premium Quality Aggregate	8.4 to 10.8 kg per sqm.	11.1 to 16.3 kg per sqm.
Binder (Polymer Modified Emulsion)	13 – 15% by weight of aggregate	10 – 15% by weight of aggregate
Additive	Up to 2% by wt of aggregate	Up to 2% by wt of aggregate
Cement/Filler	0.5 – 2.0% by weight of aggregate	0.5 – 2.0% by weight of aggregate
Water	13 – 15% by weight of aggregate	10-15 % by weight of aggregate

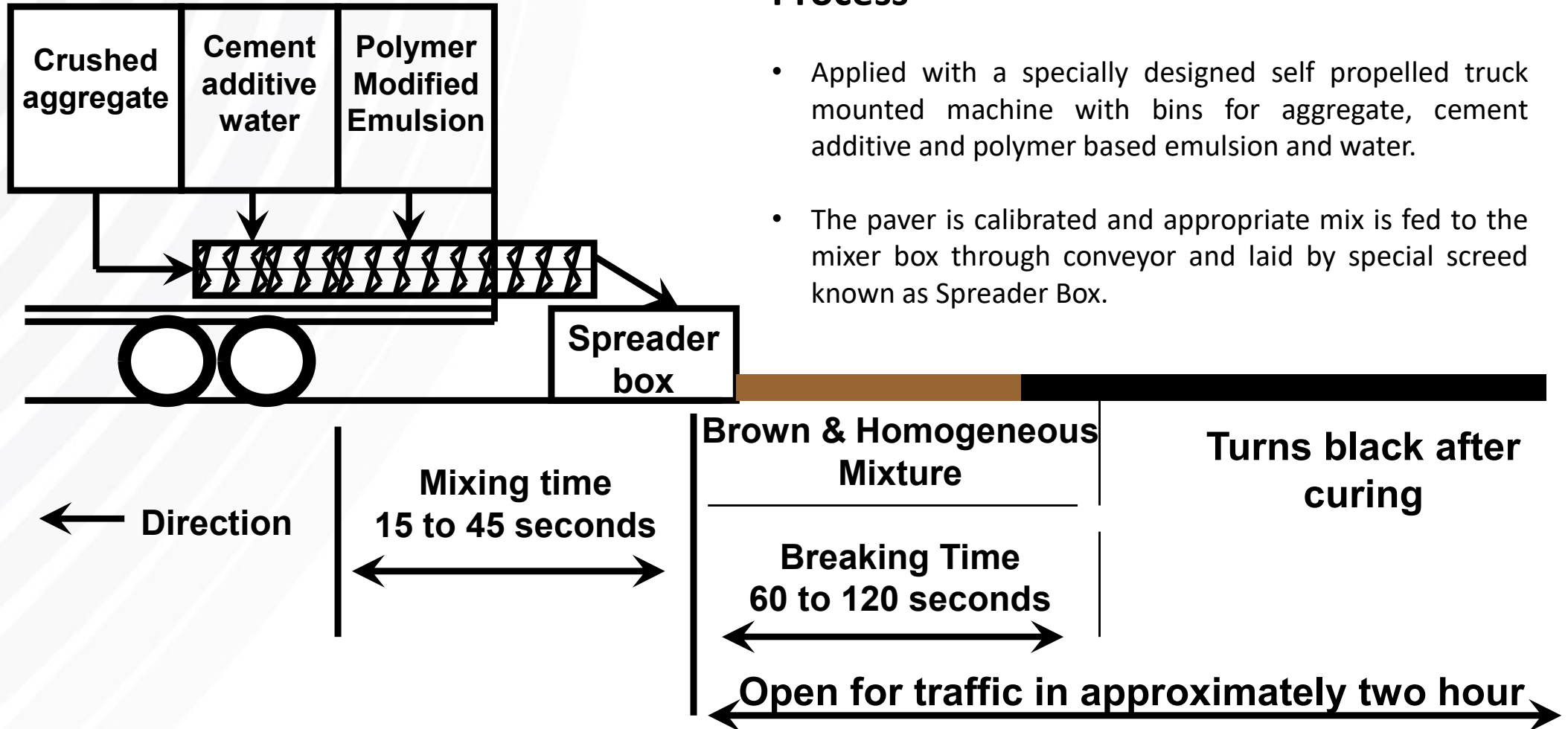
ADVANTAGES

- ✓ Quick Application with minimum traffic hold up and traffic opening in max 2 hrs, causes minimum traffic disruption. Night placement is possible.
- ✓ Cost effective as compared to Hot-Mix (BC) and extends life span of the road.
- ✓ Rectifies surface defects and Ruts including minor cracks, hungry surface due to ageing & surface Oxidation.
- ✓ Environment friendly - Nonpolluting for environment since no heating or hot paving required
- ✓ Restores surface structure, slows the age hardening in the original road surface.
- ✓ Microsurfacing can also be done on concrete pavement to improve the riding quality. It reduces Tyre burst of Cars and ensure smother ride with less noise.
- ✓ Seals the surface and prevents ingress of water as it is a dense bitumen rich mix having polymer bitumen from 6.8% to 7.5%.
- ✓ Does not increase pavement height significantly (Road furniture, drainage is not disturbed). Saving of Natural resources.

APPLICATION METHODOLOGY

Prerequisite:

- Clean surface to ensure its free of dust and soil etc.
- Fill pot holes, cracks and Ruts.

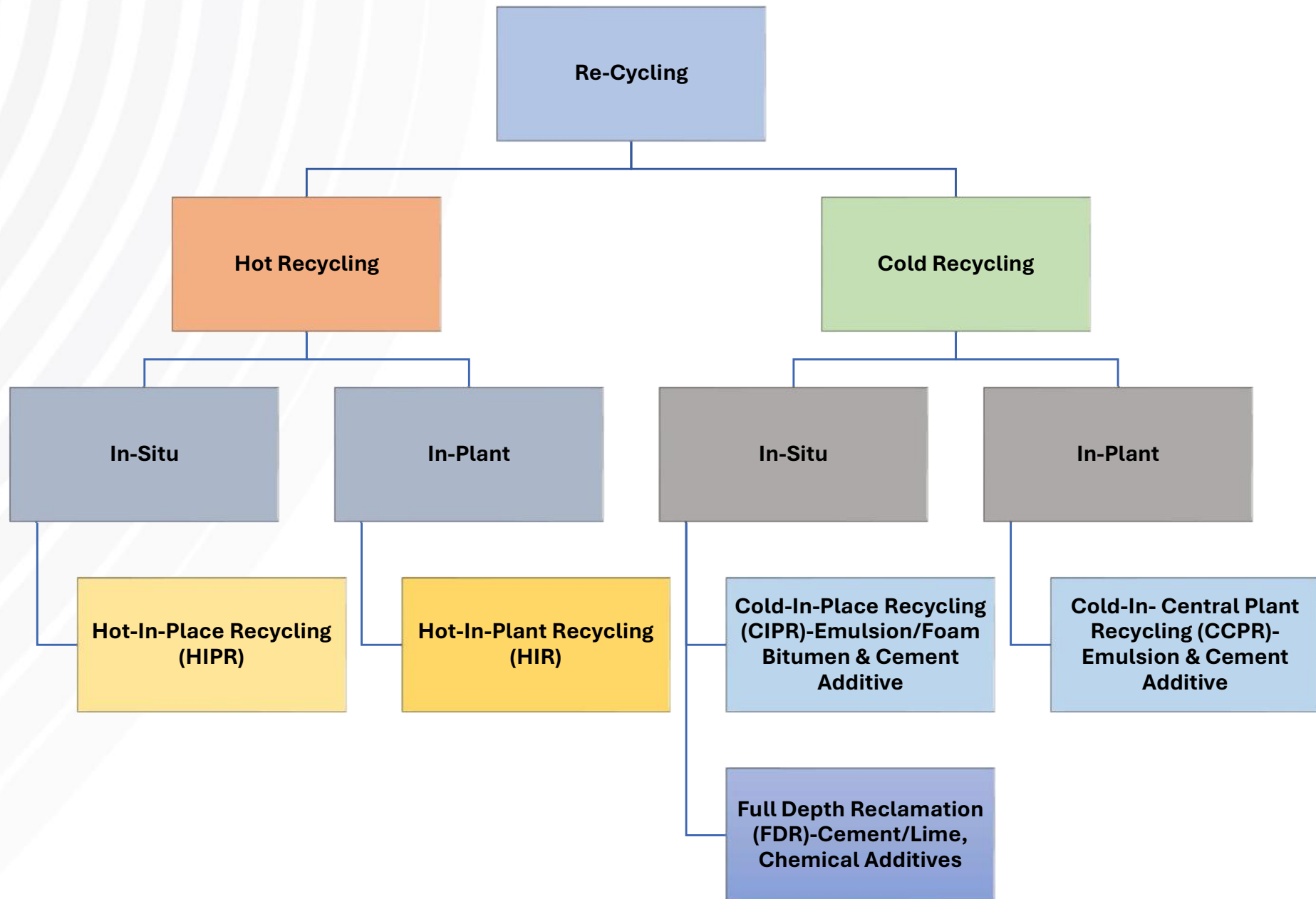


Process

- Applied with a specially designed self propelled truck mounted machine with bins for aggregate, cement additive and polymer based emulsion and water.
- The paver is calibrated and appropriate mix is fed to the mixer box through conveyor and laid by special screed known as Spreader Box.

Reclamation & Re-Cycling

The process in which the existing pavement materials are reclaimed and re-used after reprocessing.



Hot-In Plant Recycling

- Process of using **Reclaimed Asphalt Pavement (RAP)**, heating it in a central plant
- “**Reclaimed Asphalt Pavement (RAP)**- is old asphalt pavement that is milled up or ripped off the highway/Roadway. This material can be reused in new asphalt mixtures because the components of the mix—the asphalt binder & Aggregate **still have value.**”
- This process involves producing and laying hot mix asphalt using a blend of Reclaimed Asphalt Pavement (RAP) from stockpiles along with fresh aggregates and Virgin binder to meet design specifications.

10-50% RAP or more can be utilized

Type of Plant is Critical

Virgin Aggregate require to match the gradation and mechanical properties

Hot-In Plant Recycling

Few Considerations:

- Type of Plant (Conventional Batch Plant, Double Barrel, Parallel Drum)
- Amount of RAP-(20%, 30%, 40%, 60%, 100%)
- Quality of RAP
- Selection of Rejuvenators for High RAP
- Fractionalization of RAP In Screening Plant
- Mix Design & Selection of Binder

****Use of Rejuvenator**

- If RAP is limited to 20%, no rejuvenators are required, and the RAP can be added as cold RAP into a pug mill
- If 20 to 50% RAP has to be used in the design of bituminous mix, a suitable rejuvenator has to be added

Advantages of Using RAP



**Reduced Materials
Costs**



**Conservation of
natural resources**



**Reduced landfill
wastes**



Energy savings



**Sustainable
construction practice**

HOT IN PLANT RECLAIMED ASPHALT PAVEMENT (RAP)



HMP with RAP attachment...37% RAP used in DBM at FRHL Project.

HOT IN PLANT RAP



HMP with RAP attachment...37% RAP used in DBM at FRHL Project.

HMP with RAP attachment...25% RAP used in DBM at MBEL Project.



FULL DEPTH RECLAMATION (FDR)

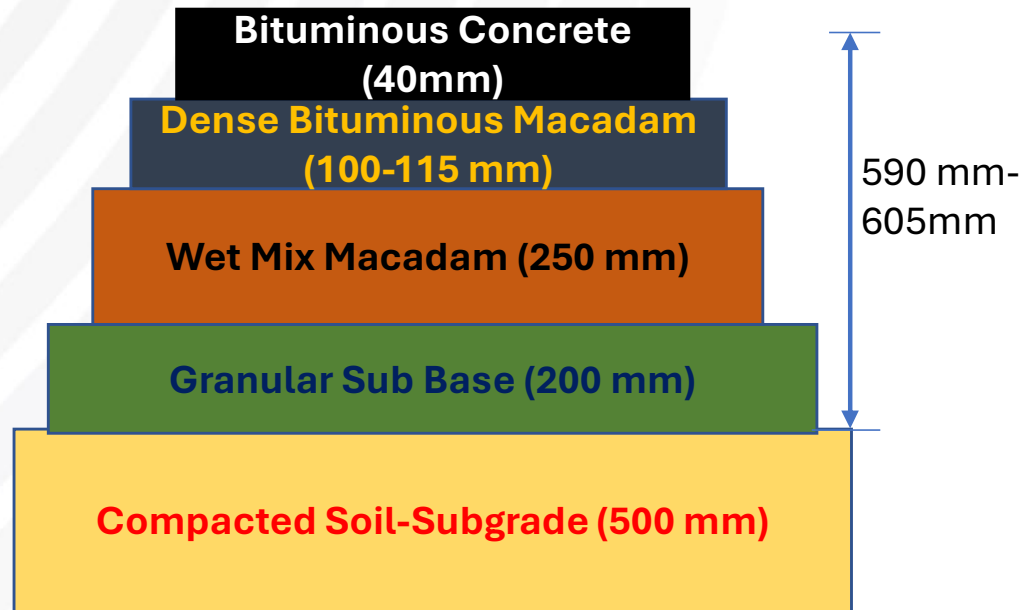
Full depth reclamation is a process in which all of the asphalt pavement section and a predetermined amount of underlying materials are treated with recycling agents to produce a stabilized base course. Asphalt emulsions and/or chemical agents or fly ash and Portland cement, Lime or combination thereof are added as recycling agents.

The main steps include pulverization, introduction of additive, shaping of the mixed material, compaction, and application of wearing or surface course. This method of recycling is normally performed to a depth of 100 to 300 mm (4 to 12 in)

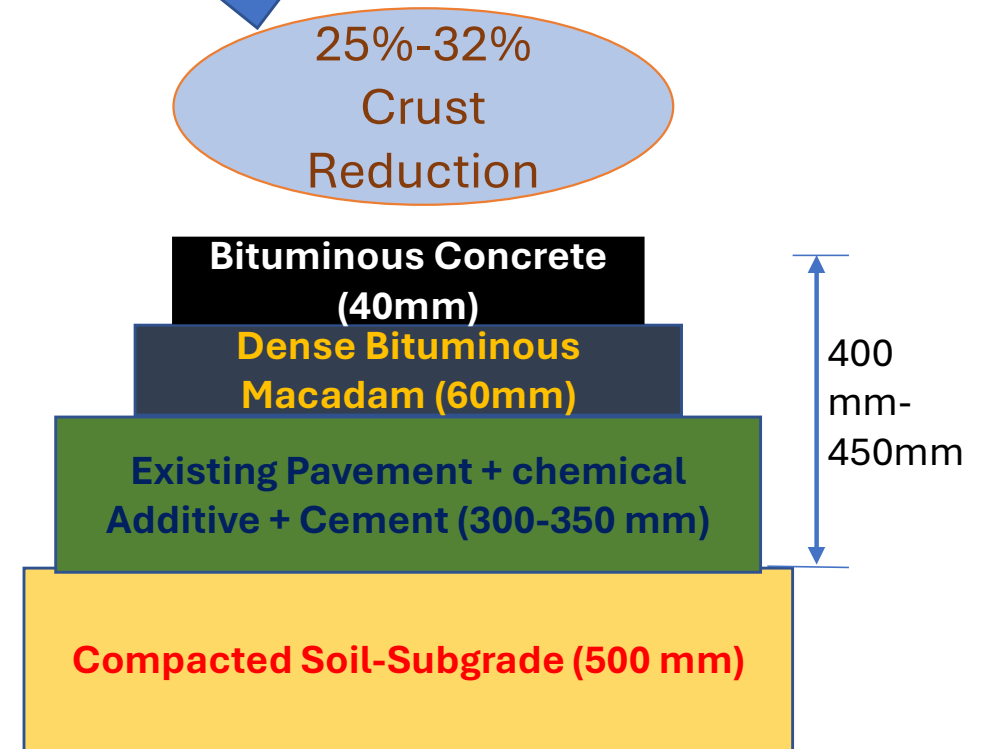
Full depth reclamation has been recommended for pavements with deep rutting, load-associated cracks, non-load associated thermal cracks, reflection cracks, and pavements with maintenance patches such as spray, skin, pothole, and deep hot mix. It is particularly recommended for pavements having a base or subgrade problem.

TYPICAL CROSS-SECTION for Flexible Pavement

Conventional Flexible Design



Stabilized Pavement With Full Depth Recycling Technology



For Traffic > 20MSA
CBR = 8%

Stabilization of Soil or Sub-Base/Base Course or Existing Pavement Crust - Construction Process



**Cement Spreading by
Microprocessor
Controlled Spreader
Truck**



**Addition of Liquid
Chemical Additive**



**Pulverization of soil
with Recycler**



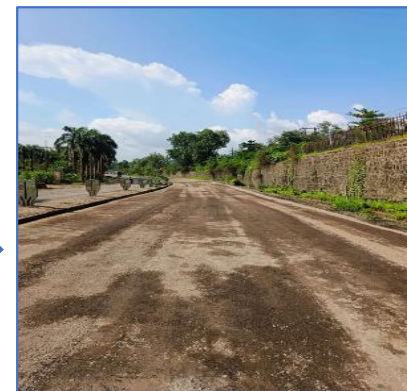
**Compaction by Pad
Foot Roller**



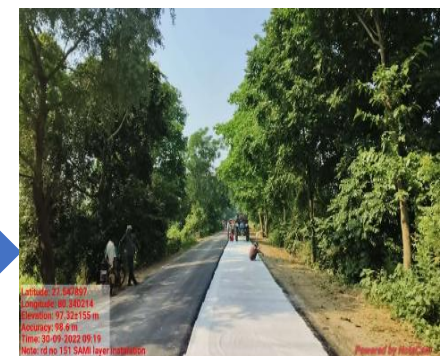
**Grading & Profiling
with motor Grader**



**Compaction by Soil
Compactor**



**Final surface after
Compaction**



**Laying of Paving fabric
and Providing BC / PQC
over the stabilized
Layer**

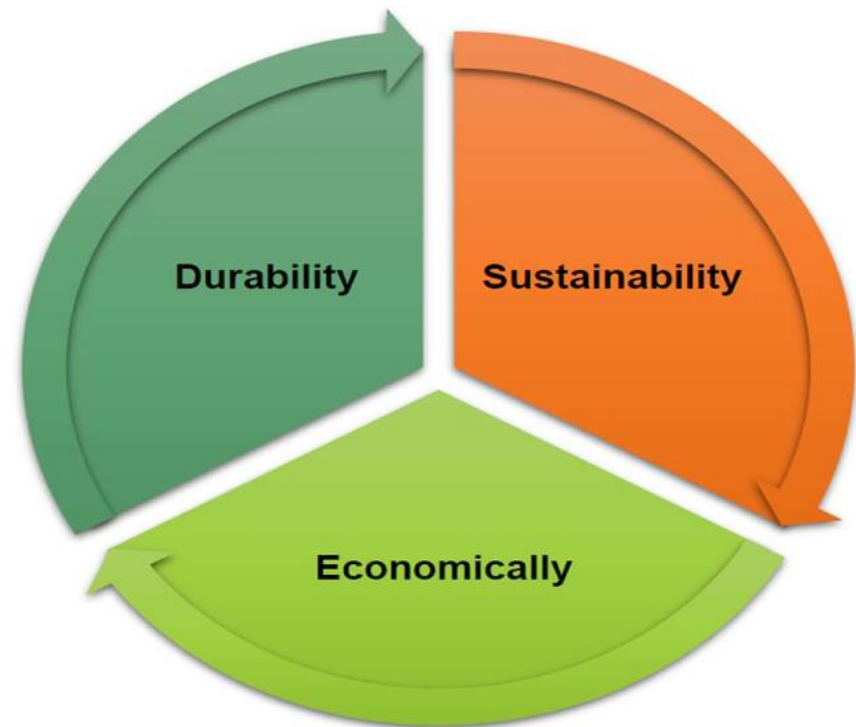
ADVANTAGES OF FDR

“Make Your Resource Go the Extra Mile (Kilometer) with Engineered Solutions”

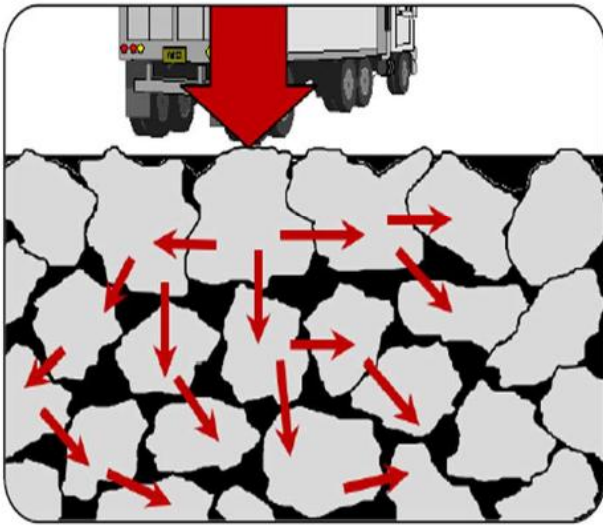
 Lower Cost	✓ Between 10-25% less expensive than traditional mill & fill or remove and replace ✓ Reuse of materials in-place saves on purchase, excavation, trucking and reduces burden on surrounding roads ✓ Requires thinner surface course than the traditional construction methods
 GREEN TECHNOLOGY	✓ Conserves resources by recycling the existing material ✓ Reduce carbon foot prints ✓ Air quality problems resulting from dust, smoke and fumes are eliminated ✓ Environmental friendly, since disposal problem is avoided
 ENGINEERING BENEFITS	✓ Enhance road performance with better strength, impermeability, and flexibility ✓ Improve the structural capacity and durability ✓ Eliminates the need for a levelling course and address re-profiling & road widening ✓ Reduces swelling to impart dimensional stability ✓ Provides moisture and frost resistant base
 TIME SAVING	✓ In-Place work eliminates time for trucking and hauling ✓ Only moderate traffic disruptions ✓ Decrease construction times minimize impact to the travelling public ✓ Fast construction cycle

Stone Matrix Asphalt (SMA)

- Stone Matrix Asphalt (SMA) is a durable and long-lasting pavement technology that enhances road performance and its longevity.
- With its high resistance to rutting and cracking, SMA is an ideal choice for high traffic roads, highways and port roads.
- Stone Matrix Asphalt is a gap-graded mix that consists of a high proportion of coarse aggregates, providing superior stone-to-stone contact.
- This dense structure enhances resistance to deformation and cracking, making it an excellent choice for heavy traffic loads.



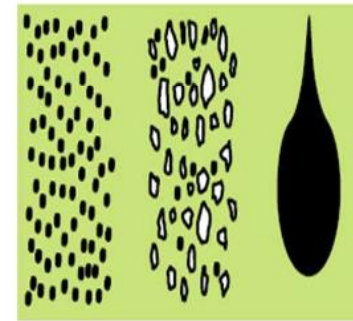
Stone Matrix Asphalt (SMA)



Stones to Stone
/Stone Matrix



Stone Matrix Asphalt (SMA)

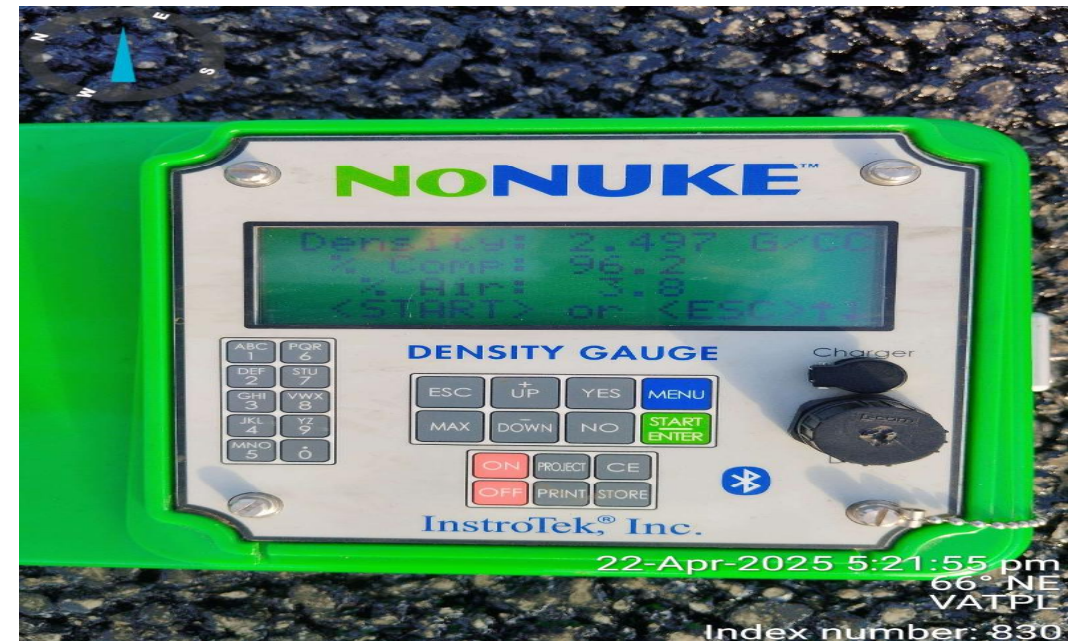
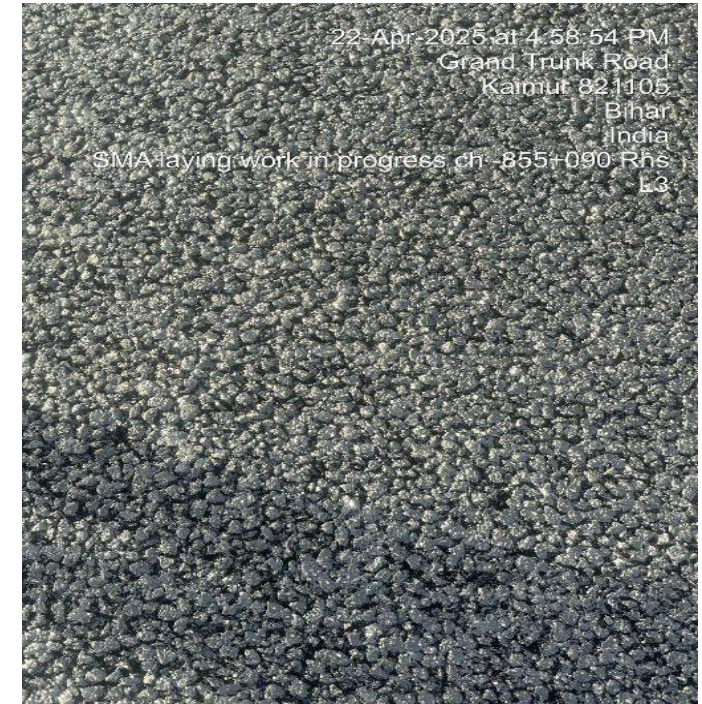


Fine
Aggregate/Filler/
Bitumen

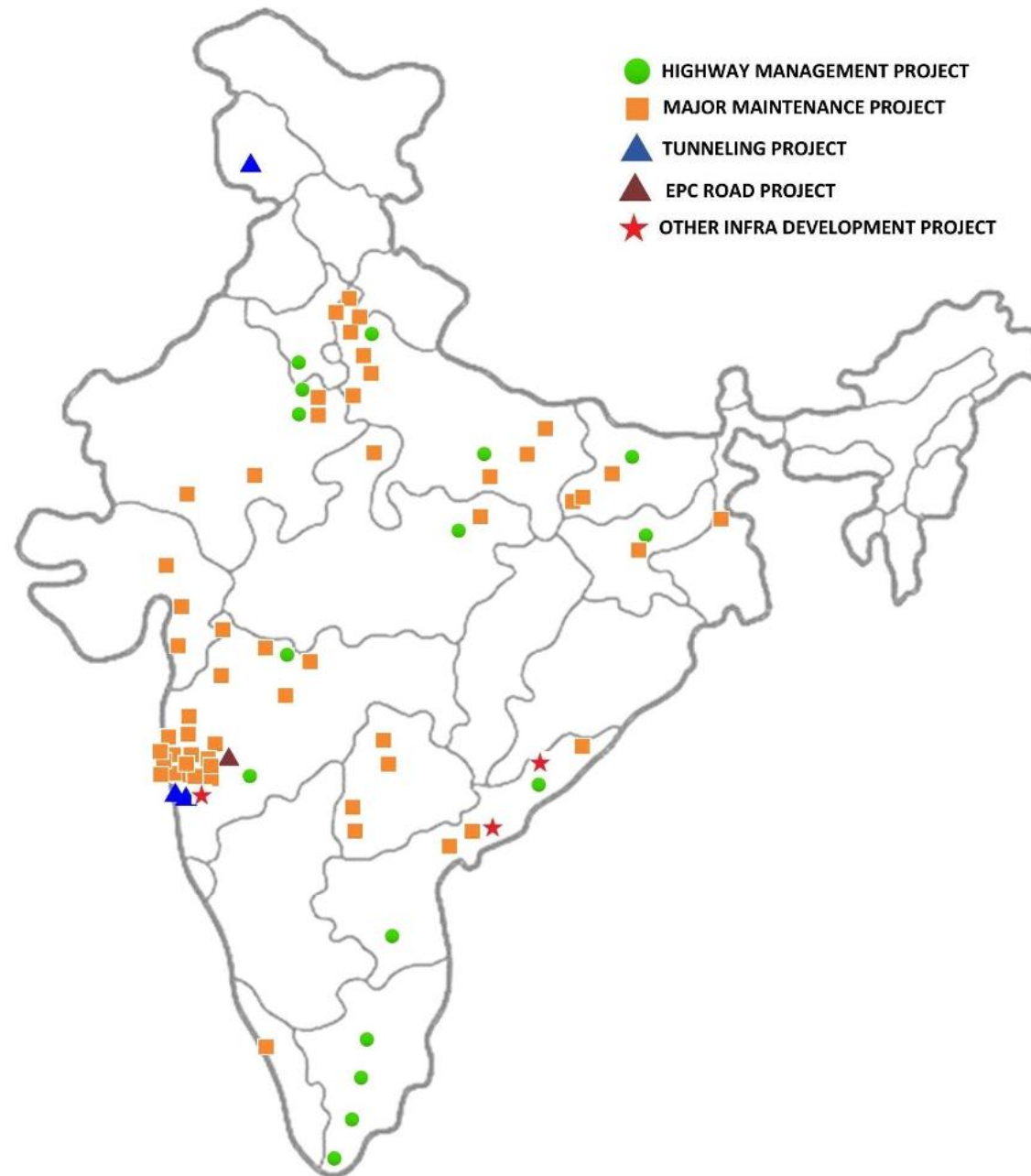


Fiber

Stone Matrix Asphalt



OUR PROJECTS





Markolines Pavement Technologies Limited

A Wing, 6th Floor, Shree Nand Dham,
Sector 11, CBD Belapur, Navi Mumbai - 400 614.
Maharashtra, INDIA

EMAIL: info@markolines.com

Phone: +91 22 6266 1111

Contact Person Details

Mr. S.P. Nagarkar

Director -Technical

sp.nagarkar@markolines.com

+91-7710002487

Mr. Anil Nikam

CEO

anil.nikam@markolines.com

+91-9833953693

Mr. Niyazahmed Momin

VP- Highway Maintenance

niyaz@markolines.com

+91- 98339 32406