

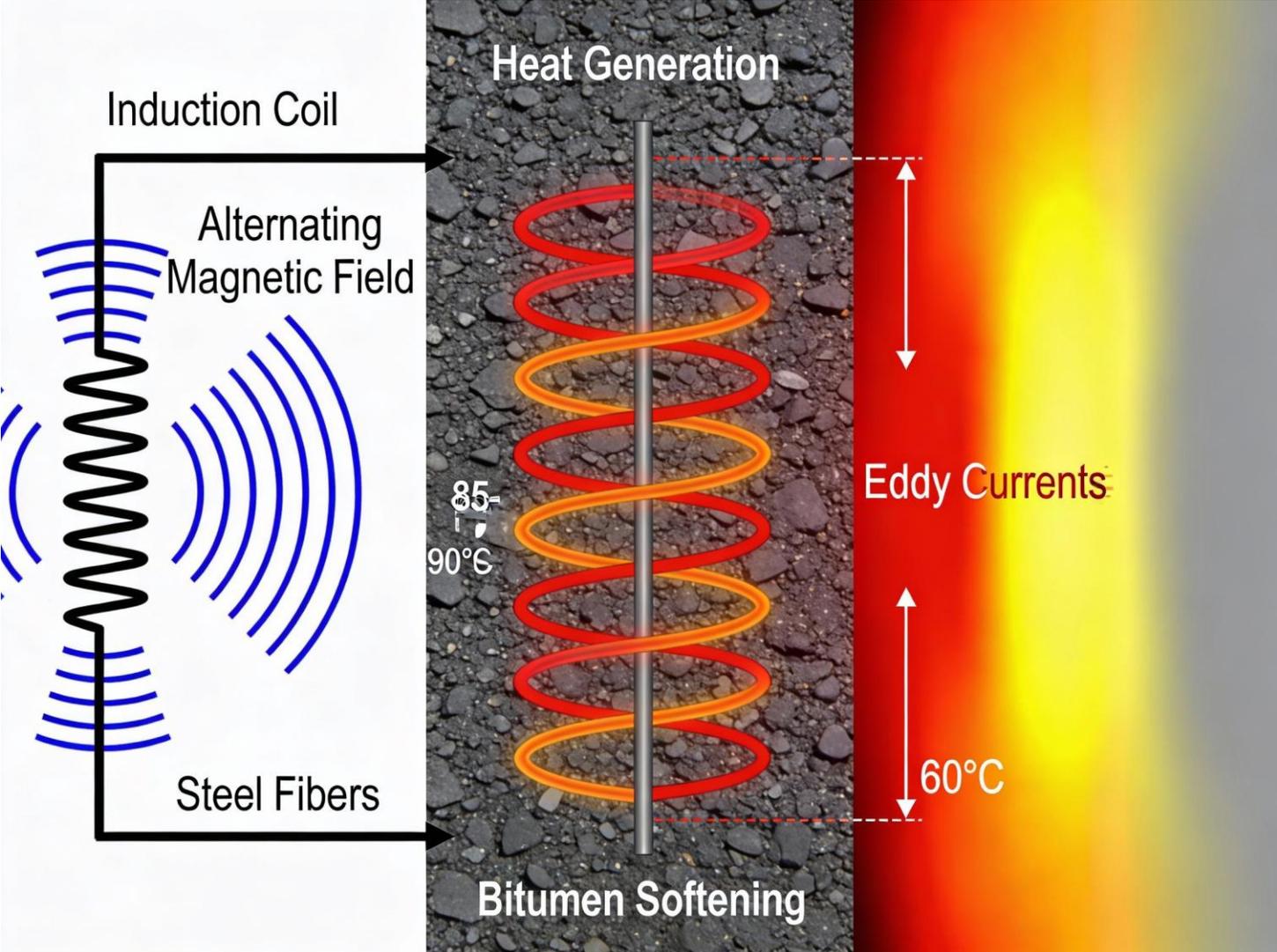


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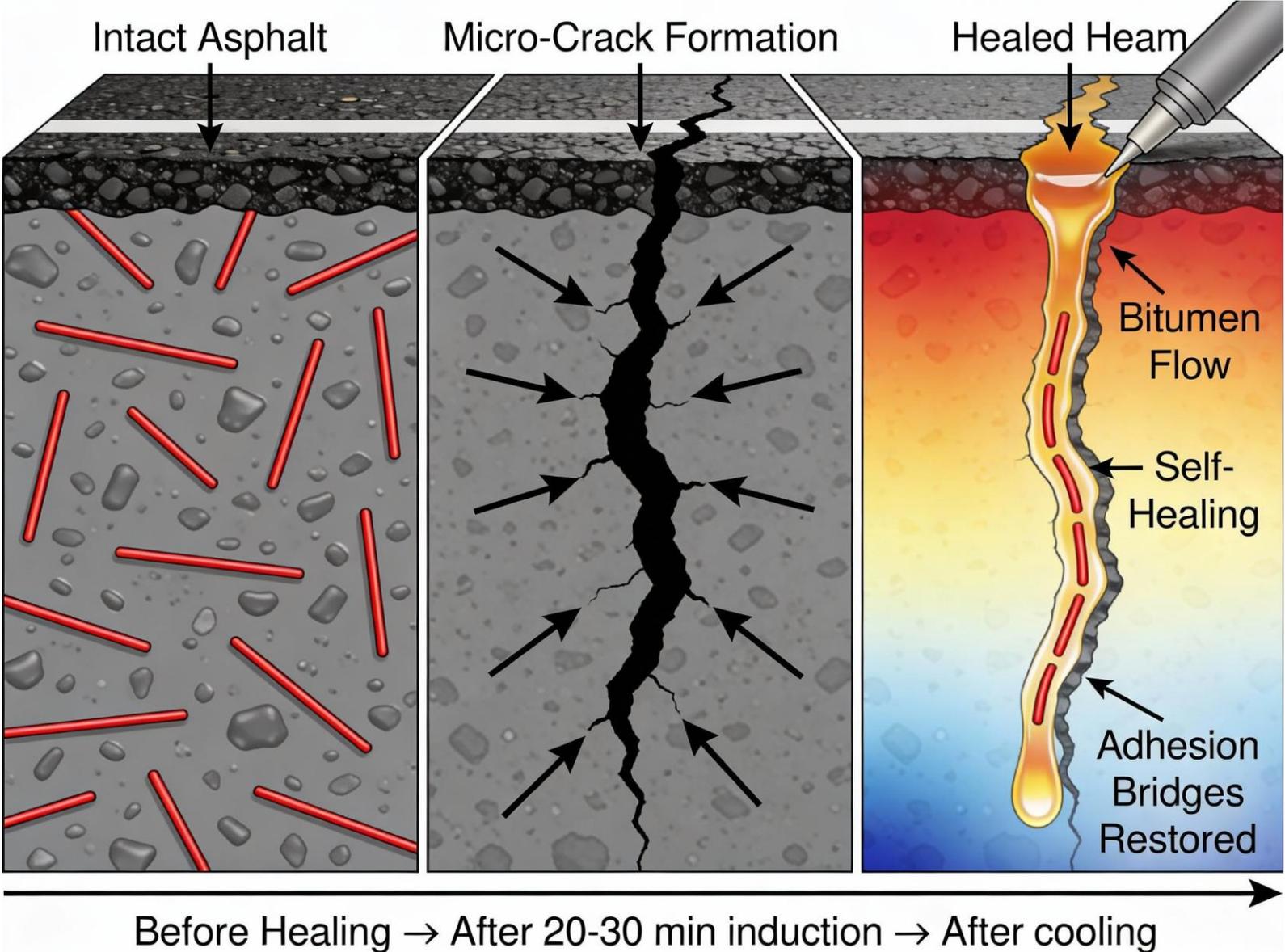
**Experience and Prospects in the
Development of Induction-healing
Materials for Road Coverings, Bridges,
Airfields using Organo-polymer and
Mineral Modified Thermoplastics**

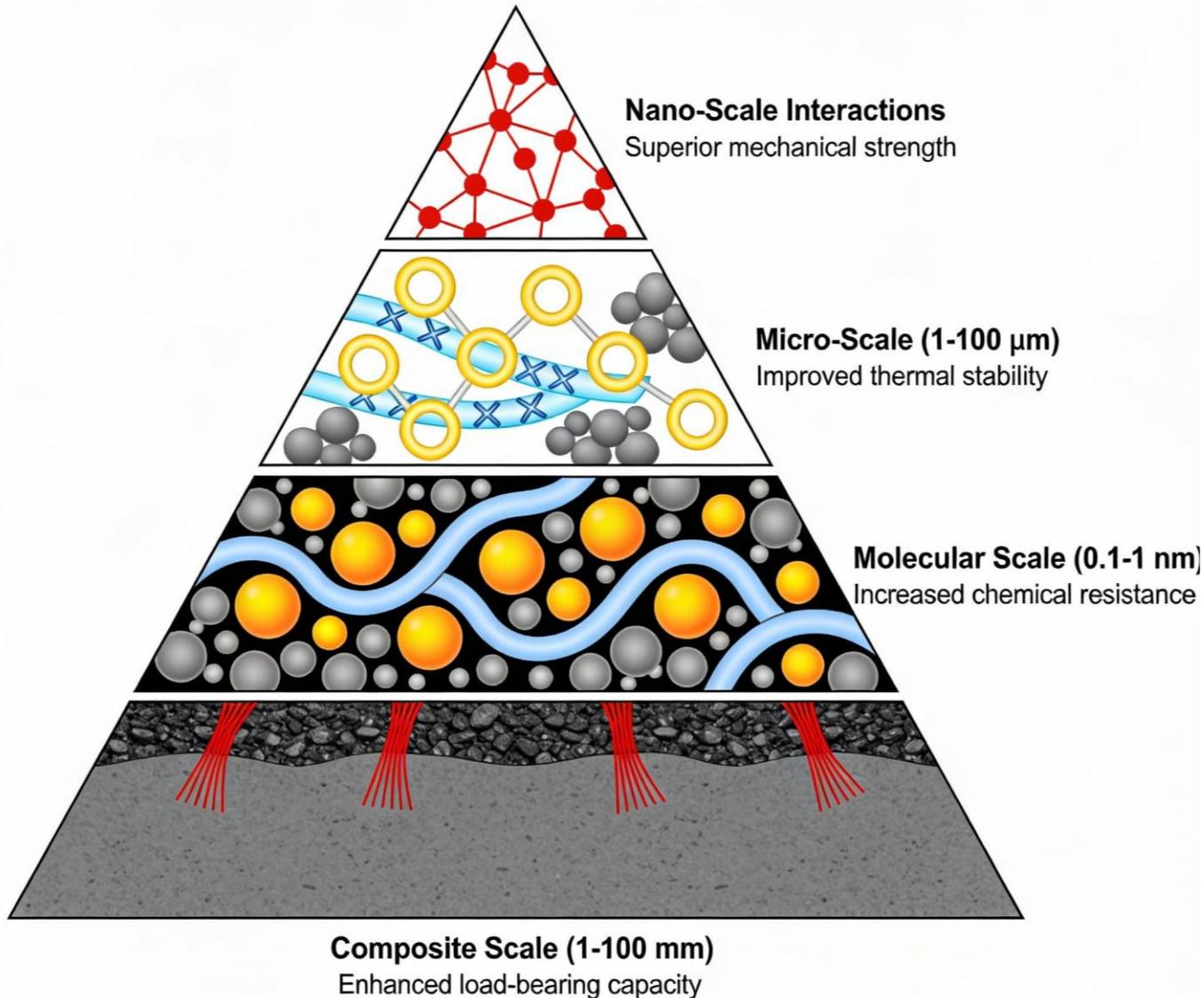
New Delhi
2026

A detailed diagram shows how an alternating magnetic field generates eddy currents in steel fibers, converting them into thermal energy for curing asphalt concrete.



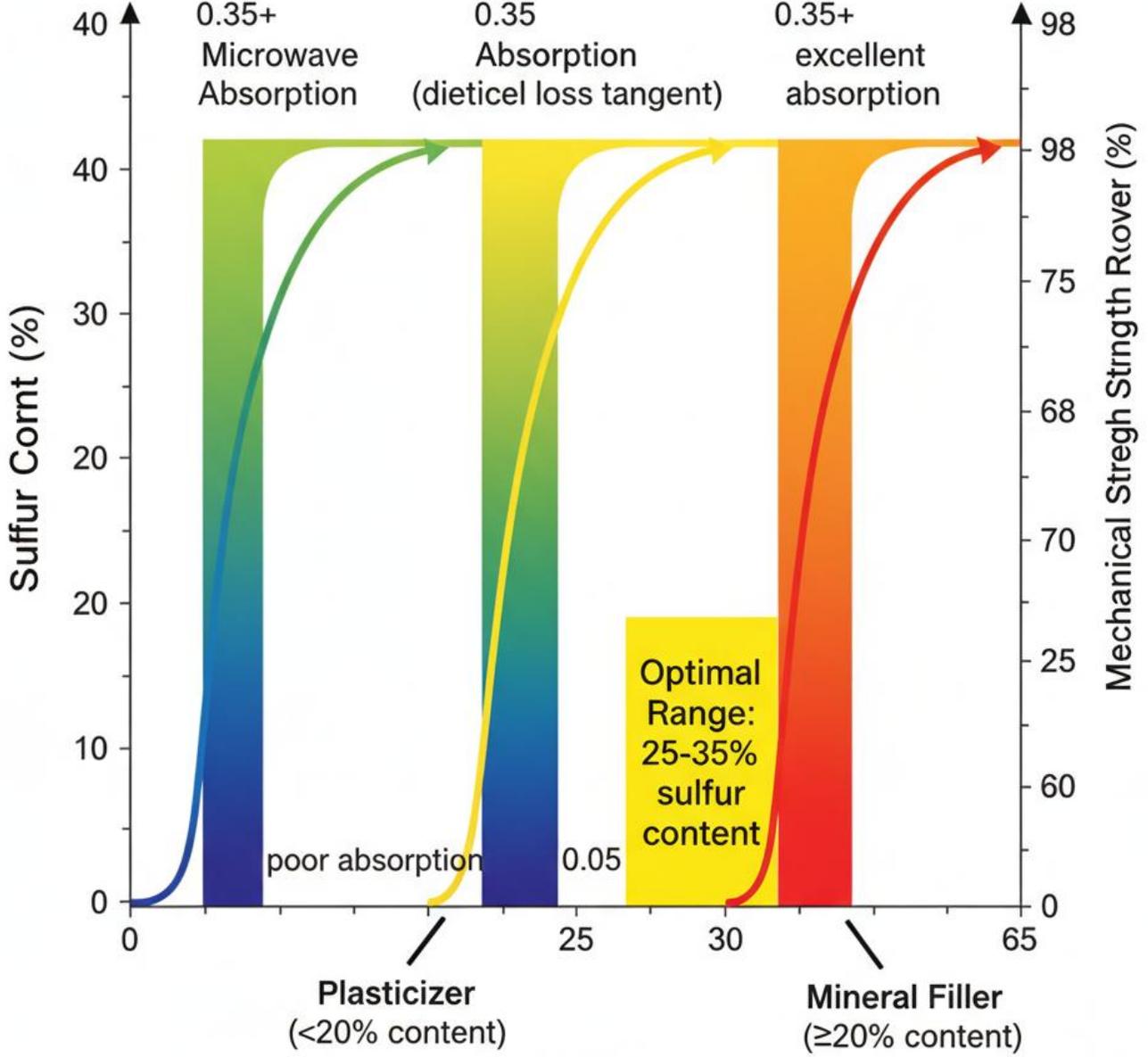
Comparison of four types of asphalt concrete in progression from traditional to combined with epoxy resin, steel fibers and sulfur. The three-step process demonstrates: microcrack formation → induction heating activation → filling and hardening of softened bitumen.





The multi-level pyramid shows the organization of the material from the composite scale to the molecular interactions of gray-epoxy systems.

Coupling of Sulfur Content, Microwave Absorption, and Mechanical Property Enhancement



Three synchronized scales show the relationship: sulfur content → microwave absorption → strength recovery (optimum 25-35%).

The two-sided diagram shows the advantages of both methods: induction with a duration of 20-30 minutes versus microwave heating with sulfur in 1-3 minutes.

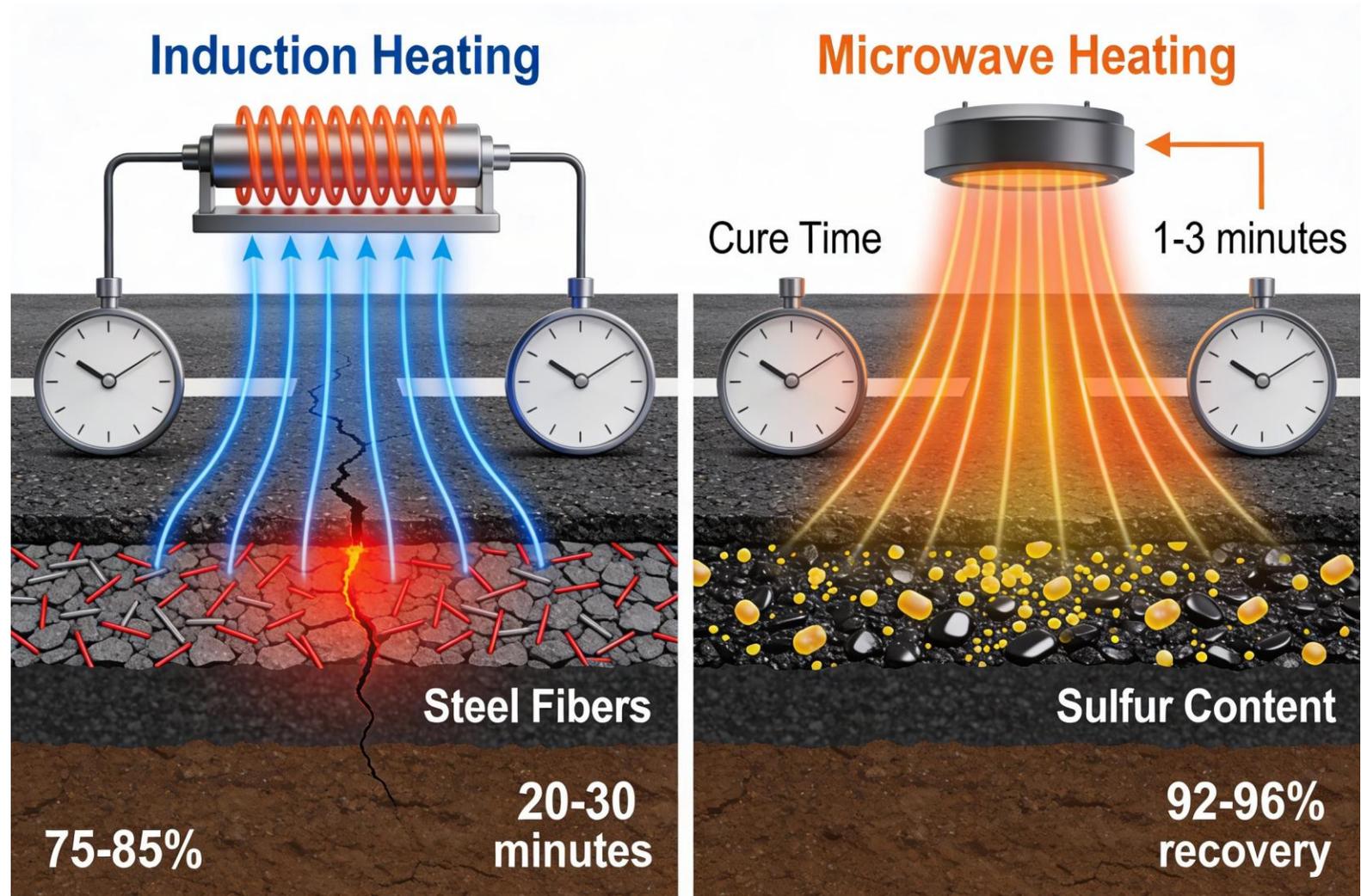
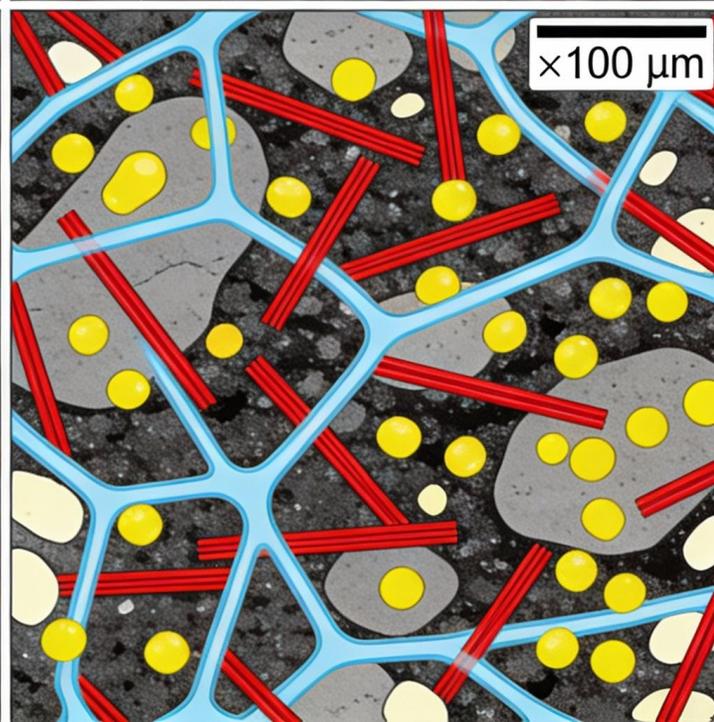
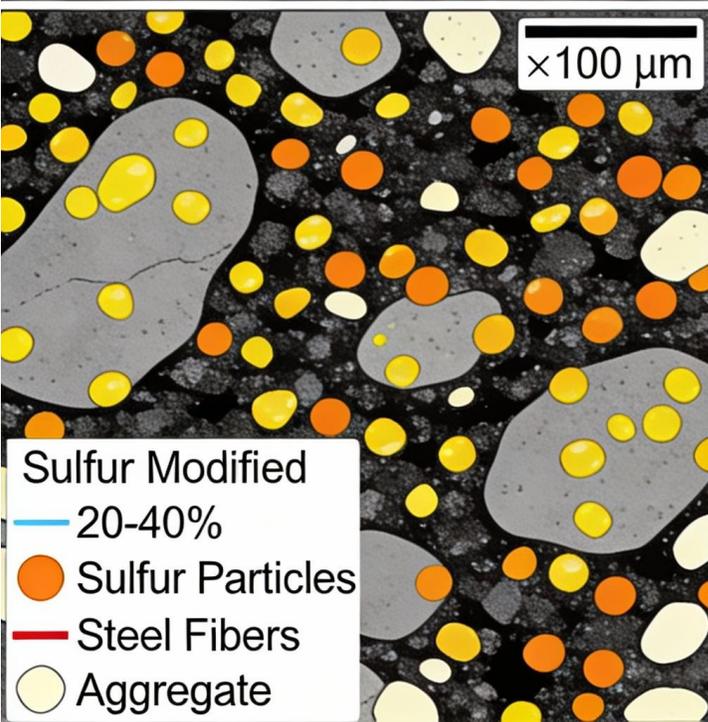
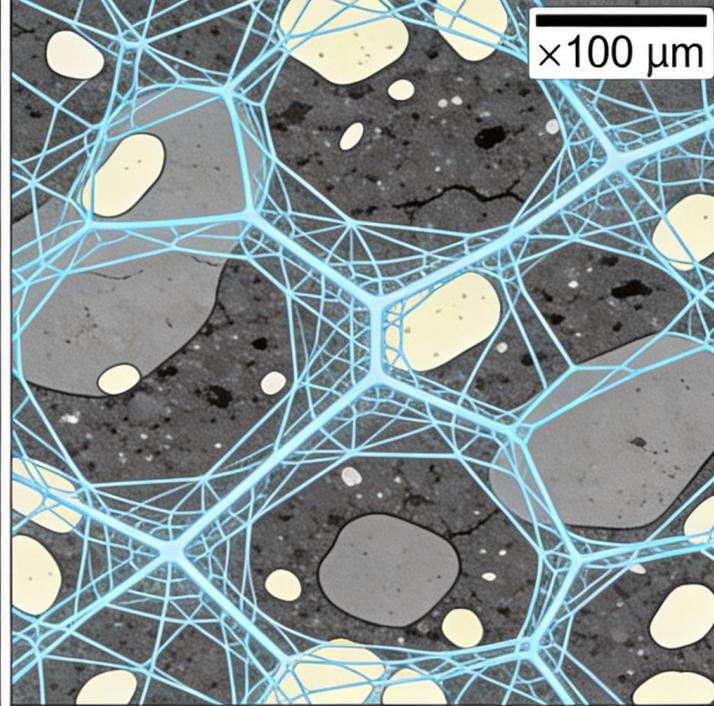
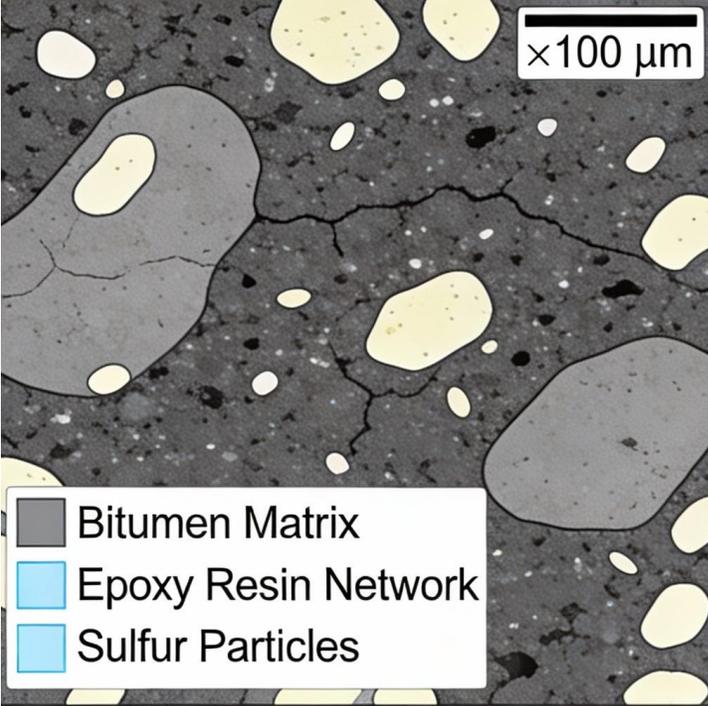


Table 1: Mechanical characteristics of asphalt mixes at 20°C

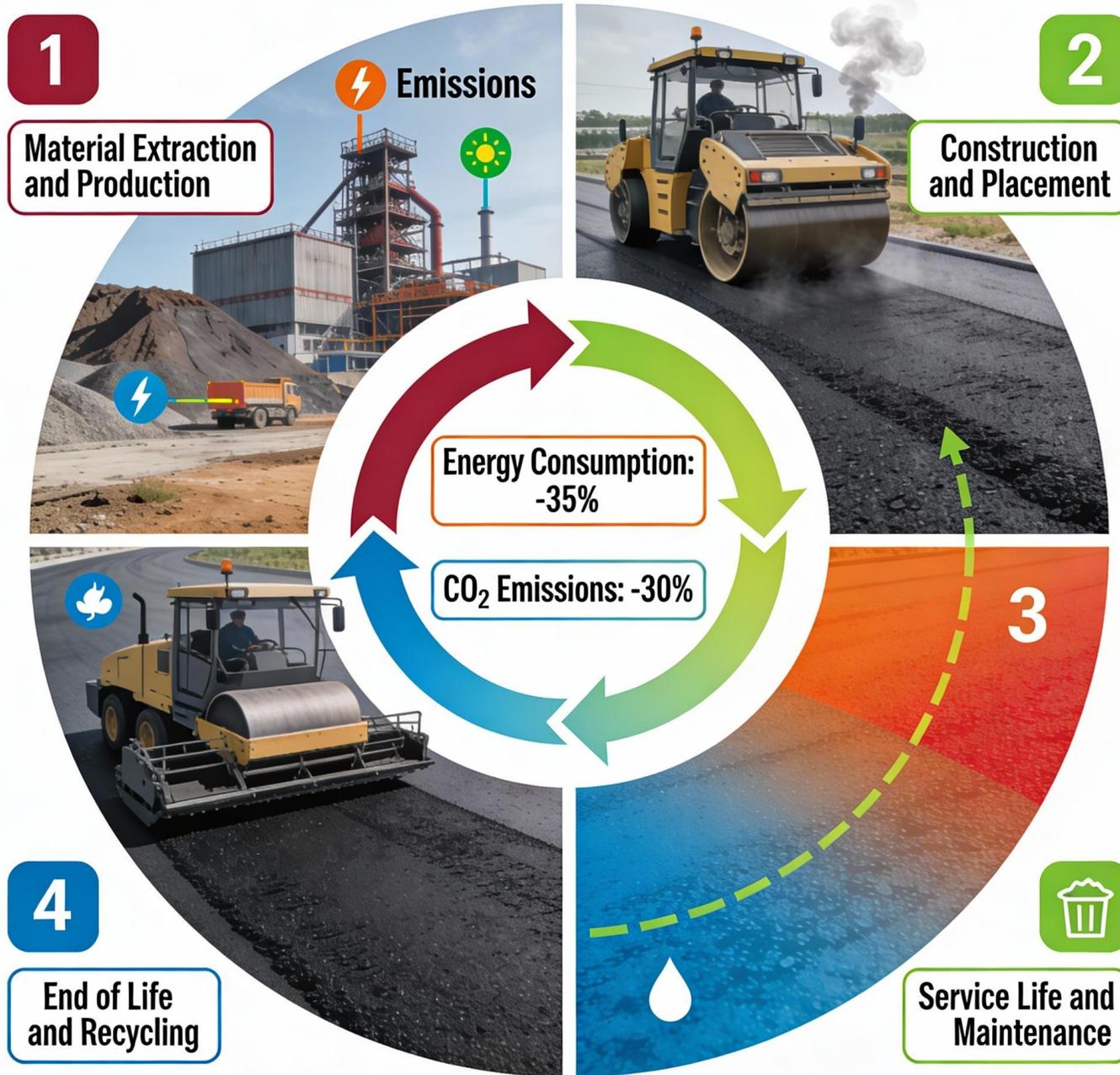
Material type and curing conditions	Modulus of elasticity (MPa)	Compressive strength (MPa)	Recovery after 15 days (%)	MICROWAVE recovery (%)
Traditional asphalt	3200	18.5	100	58-65
With sulfur 20% bitumen	4950	24.8	118	72-78
With Sulfur 40% bitumen	6200	29.6	135	81-87
5% Epoxy + steel fibers	7200	35.8	142	88-94
30% Sulfur + microwave curing	7600	38.2	156	92-96
30% sulfur + 3% epoxy + induction	8100	41.5	168	95-98



Comparison of four types of asphalt concrete in progression from traditional to combined with epoxy resin, steel fibers and sulfur.

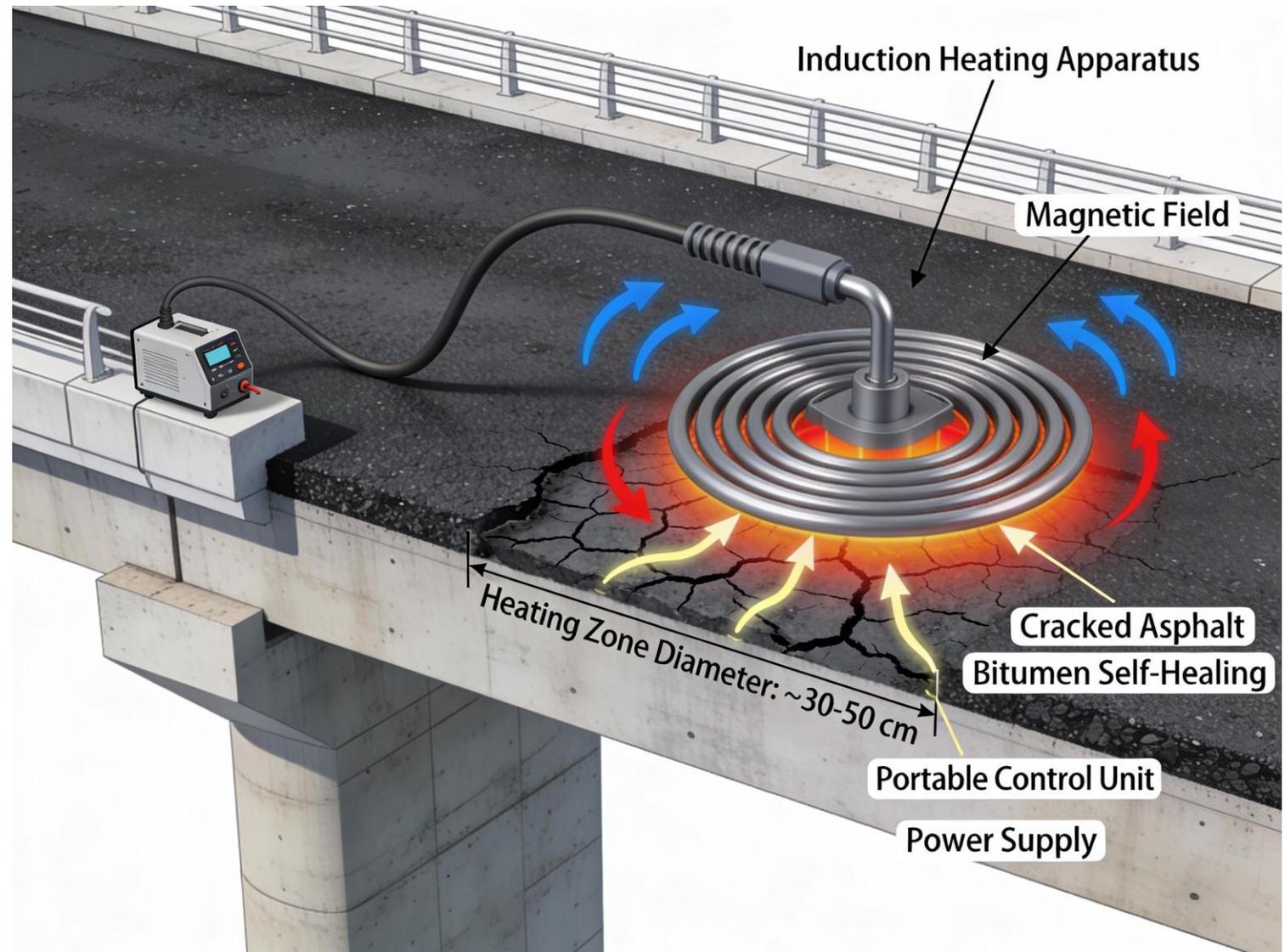
Table 2: Restoration of mechanical properties under various curing methods

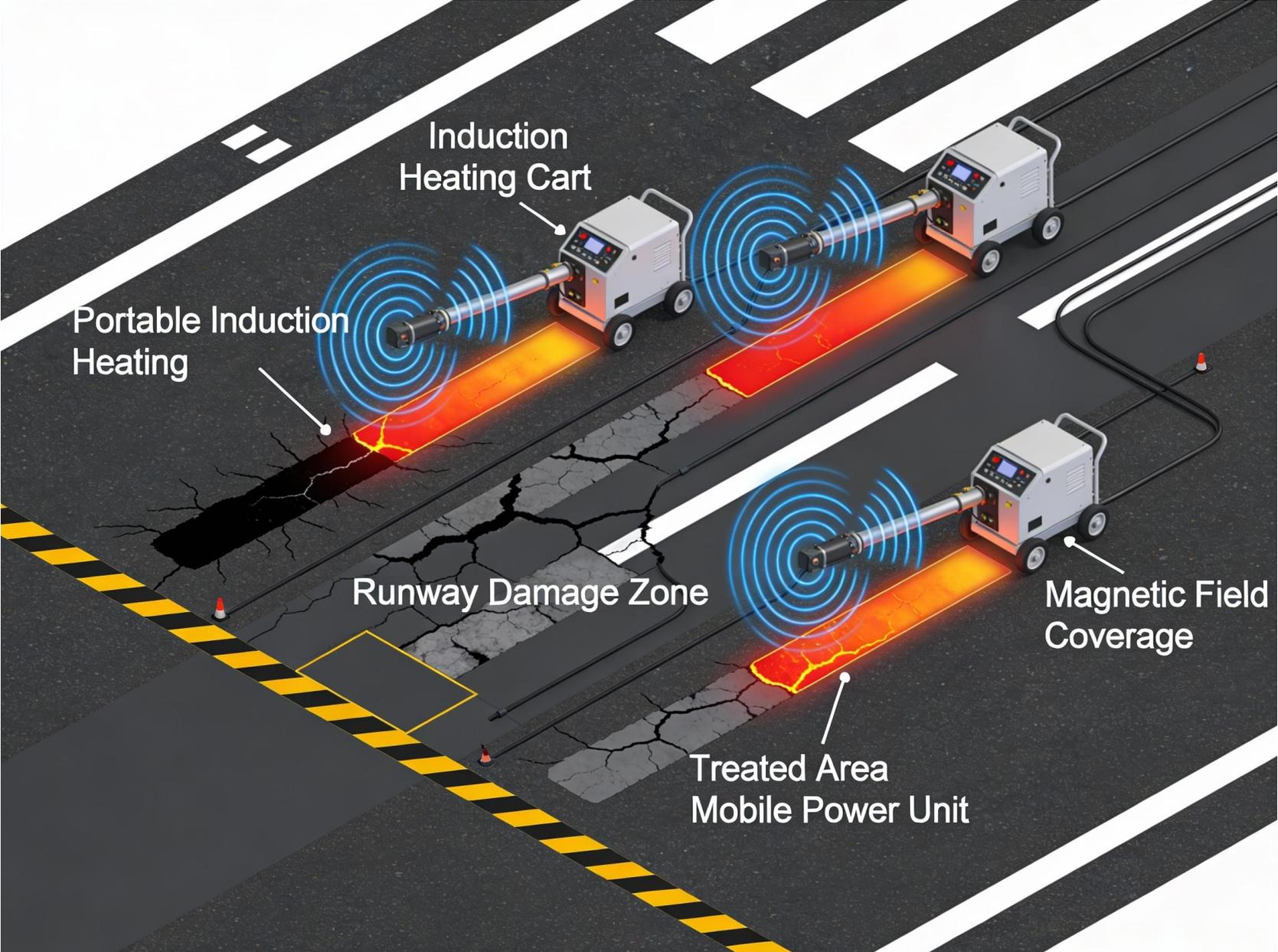
Material and curing conditions	Initial strength (kN)	Reduced strength (kN)	Processing time (min)	Recovery Percentage (%)
Porous asphalt + IO (steel fibers)	4.8	3.4	25	70.8
Sulfur 20% + IO	5.2	4.0	20	76.9
Sulfur 30% + Microwave (900 W)	5.6	5.2	2	92.9
Sulfur 30% + Microwave (1200 W)	5.9	5.7	1.5	96.6
Sulfur 40% + Microwave + epoxy 3%	6.4	6.3	1	98.4
Combined (sulfur + IO + microcapsules)	6.8	6.6	2.5	97.1



The cyclic diagram shows the advantages of the induction method at all stages: from production through operation to processing, with a 35% reduction in energy consumption.

Practical application of a portable induction installation for repairing asphalt concrete pavement of bridge structures.





A comparison of four repair methods over time from the placement of material to the opening of traffic, demonstrating significant acceleration. Isometric view of the runway with multiple portable induction heating units minimizing closing time.

Thank you for attention!