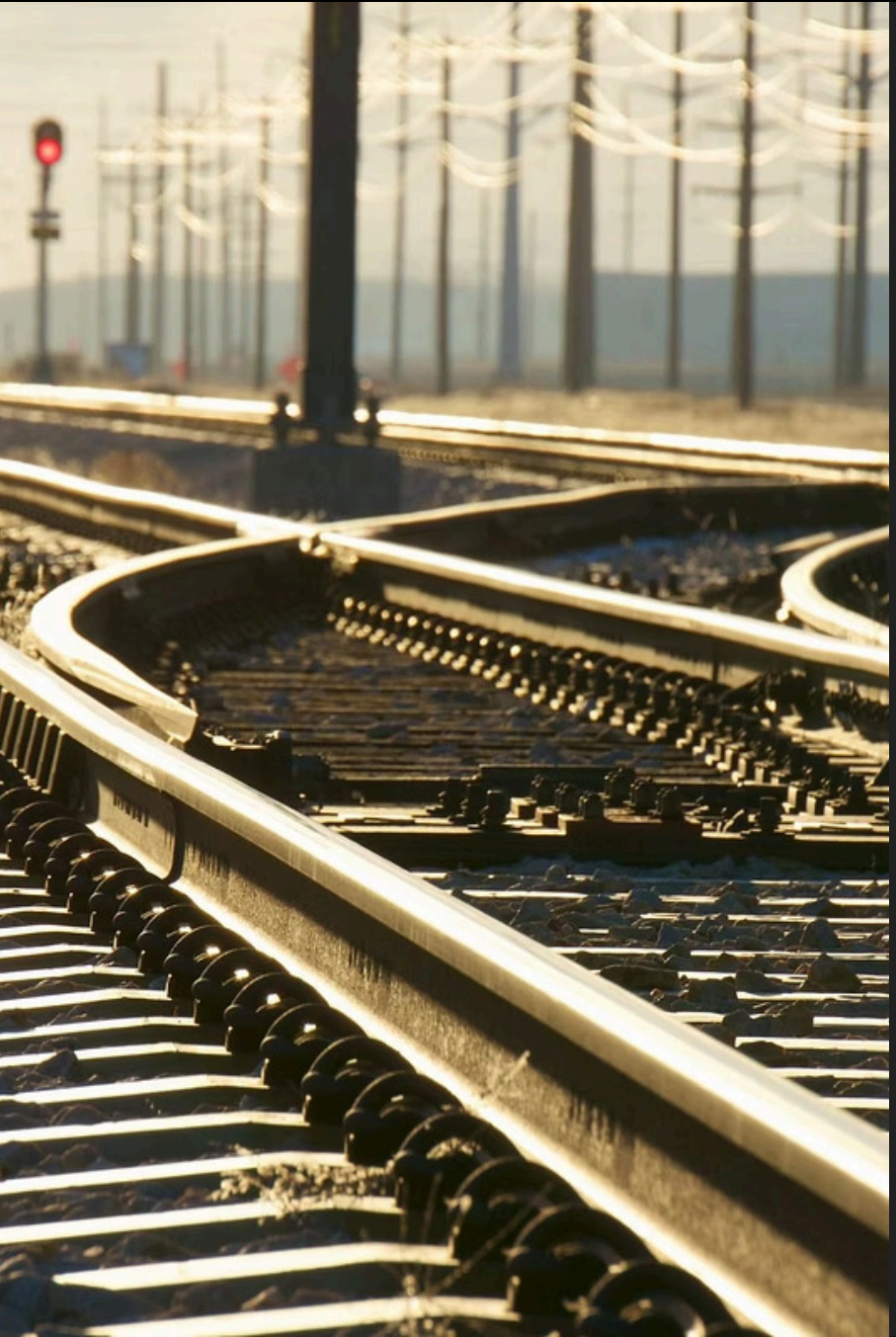


Railway Maintenance

Types, Key Areas, Tools, and Objectives

N by NORHAYATI BINTI ARIFIN (PSMZA)

Types of Railway Maintenance

Preventive Maintenance

Scheduled inspections to prevent failures.

Corrective Maintenance

Repairing faults discovered during operation.

Predictive Maintenance

Using data and sensors to forecast issues.

Condition-based Maintenance

Interventions based on real-time condition monitoring.

Track Maintenance

Rail Inspection

Detect surface cracks and wear to prevent fractures.

Ballast Tamping

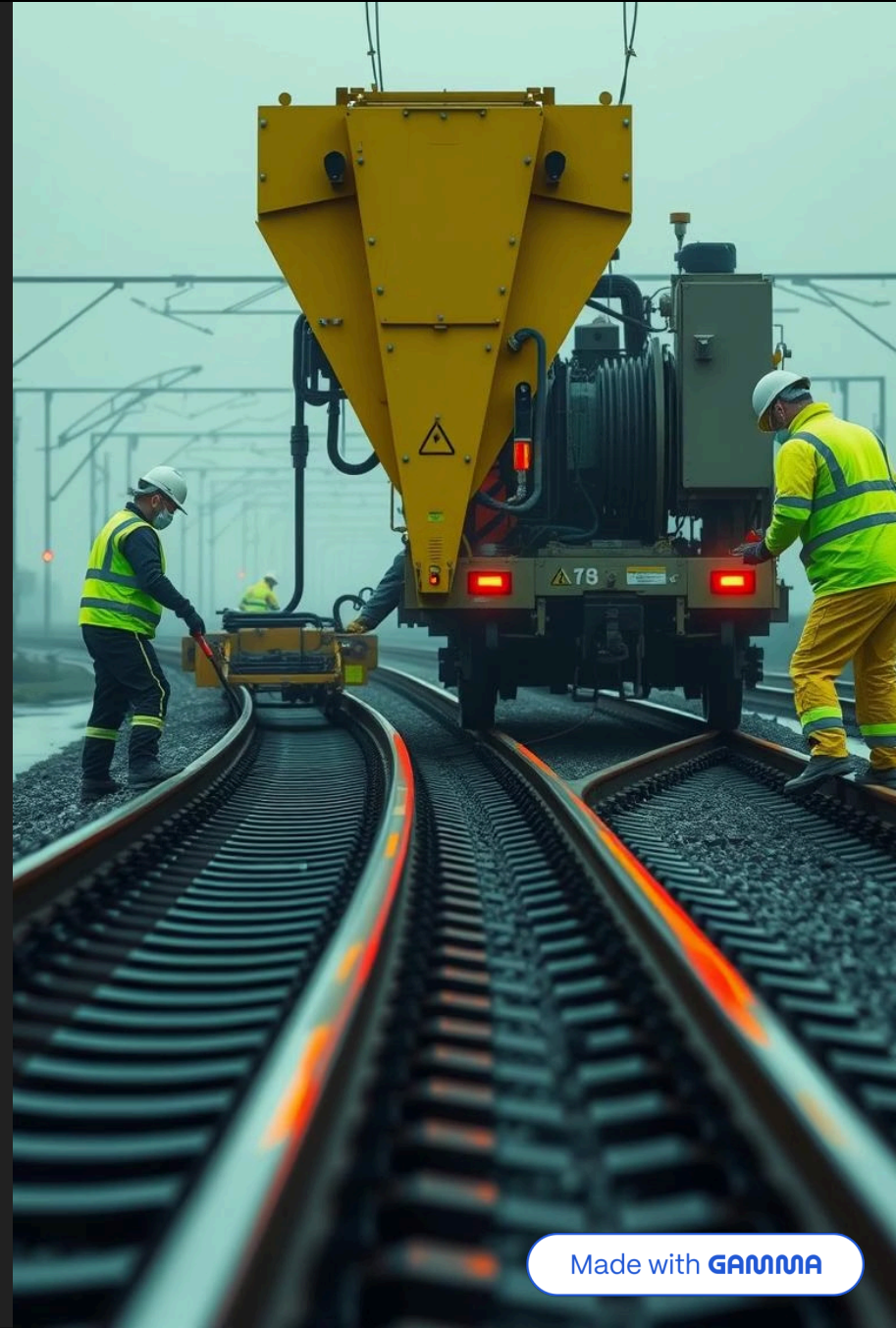
Stabilizes track geometry by compacting ballast beneath sleepers.

Alignment Correction

Adjusts track alignment to ensure smooth train operation.

Joint and Fastening Maintenance

Ensures proper rail fastening and replaces worn clips and bolts.



Signaling & Telecommunication Maintenance

Signal Inspection

Ensuring signal lights and indicators function correctly.

Control Systems

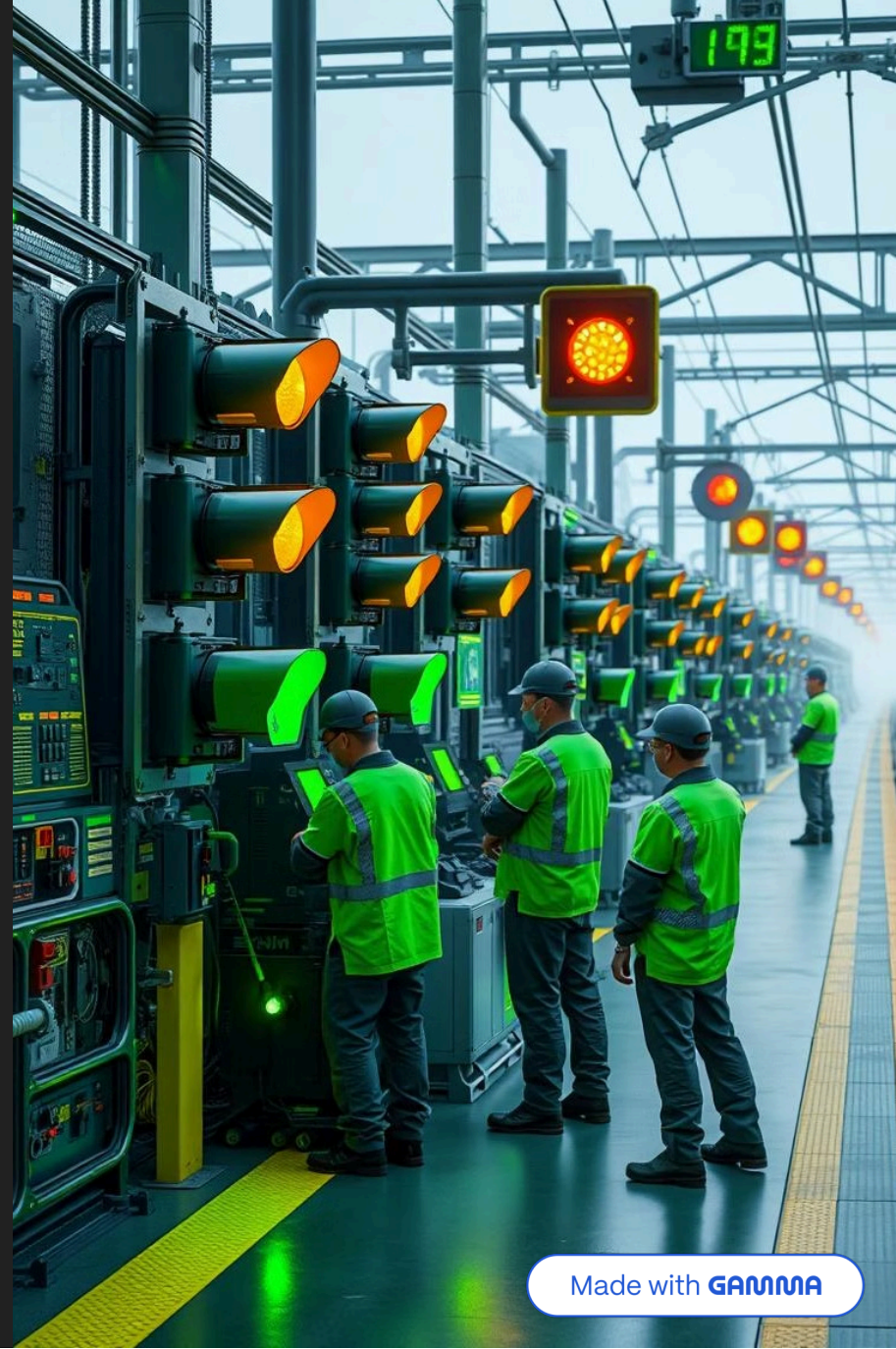
Maintaining interlocking and automation for train control.

Communication Networks

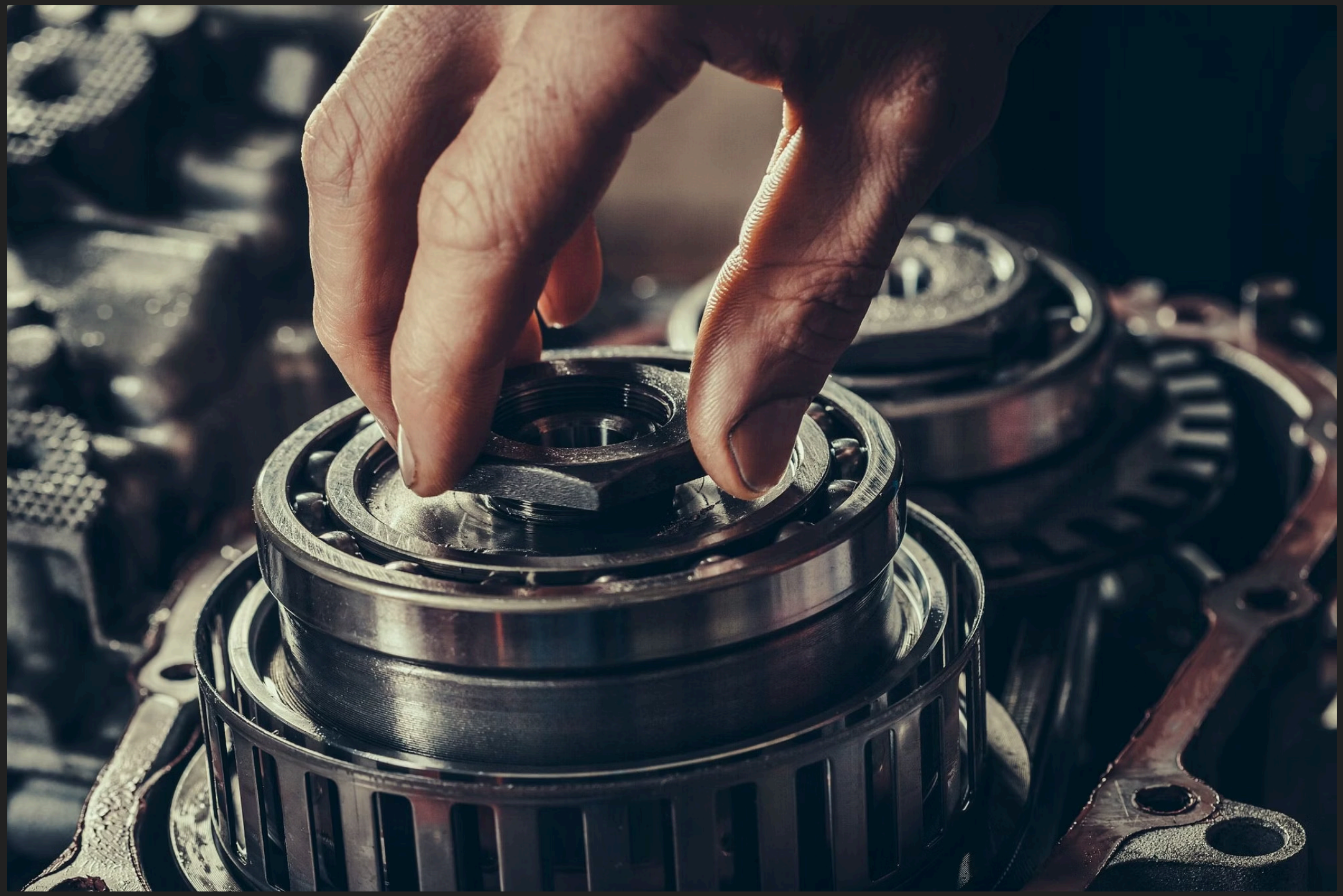
Checking fiber optics, radio systems, and emergency communication.

Backup Power

Testing batteries and generators to guarantee continuous operation.



Rolling Stock Maintenance



- Locomotive Checks: Engine oil, brakes, filters.
- Coach & Wagon: Bearings, wheels, couplings.
- Brake Testing: Safety-critical inspection.
- Cleaning & Interior: Ensures comfort and hygiene.
- Wheel Profiling: Reshaping worn wheels to prevent derailments.

Electrical & Infrastructure Maintenance

Overhead Line Maintenance

Checking wires for wear and alignment.

Power Substations

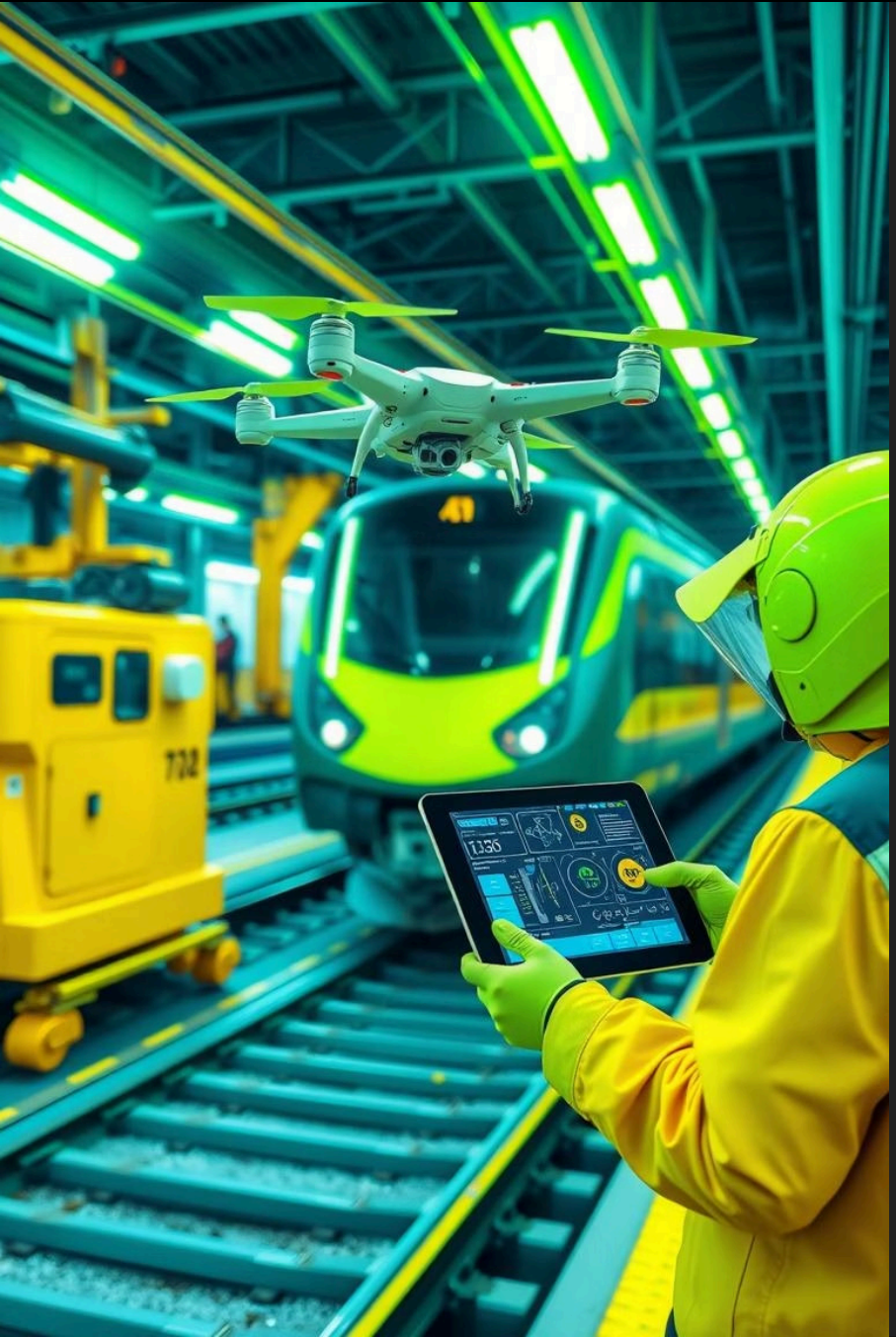
Inspecting transformers and circuit breakers.

Track Electrification

Maintaining third rail and power supply systems.

Drainage & Foundations

Preventing water accumulation to protect track integrity.



Tools & Technologies in Maintenance

Inspection Drones

Survey difficult areas and detect defects early.

Specialized Tools

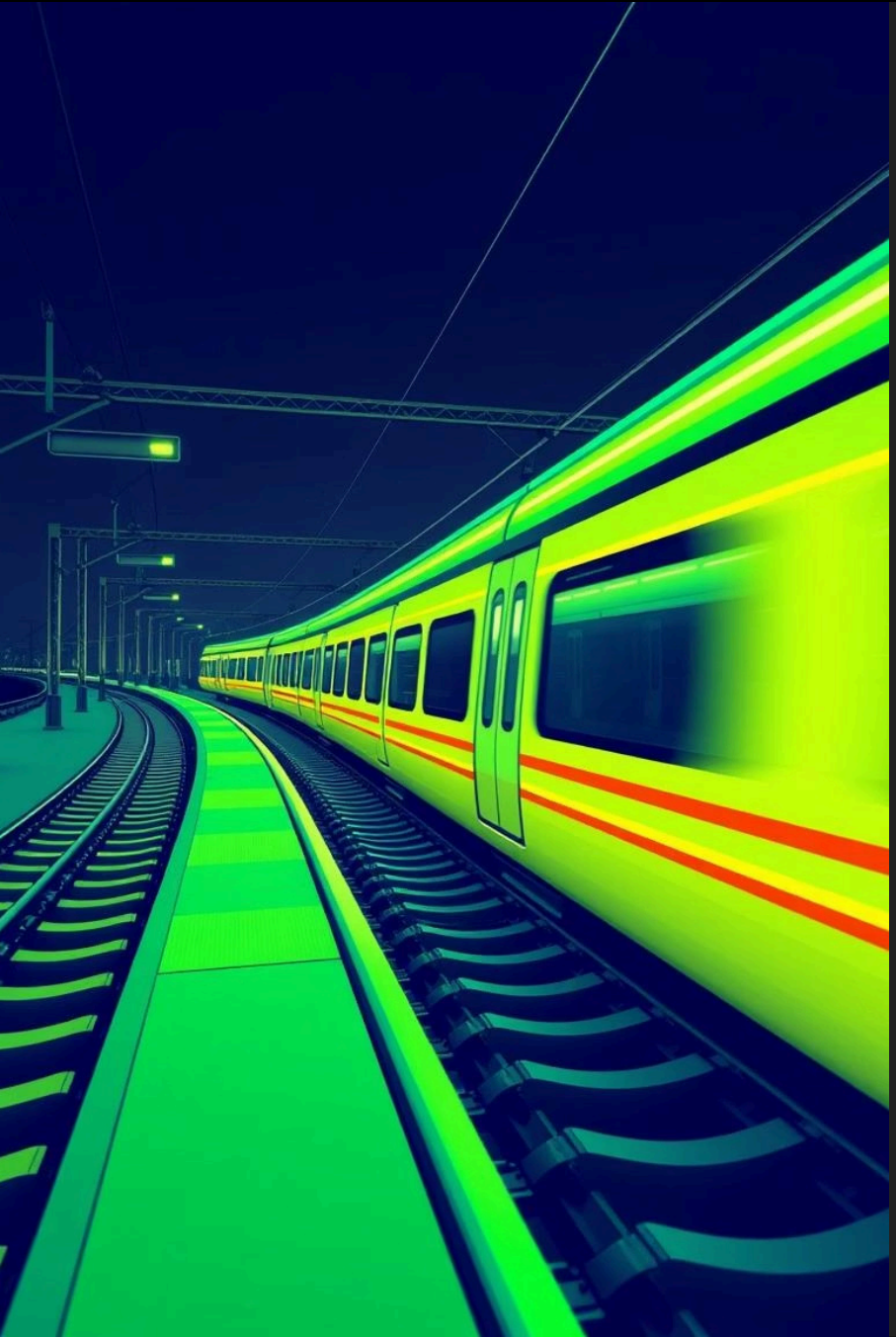
Hydraulic tampers, rail grinders, and torque wrenches.

Diagnostic Software

Real-time data analysis and maintenance scheduling.

Automated Systems

Robotic track inspection and wheel profiling machines.



Objectives of Railway Maintenance

Ensure Safety

Prevent accidents and failures in all systems.

Maximize Reliability

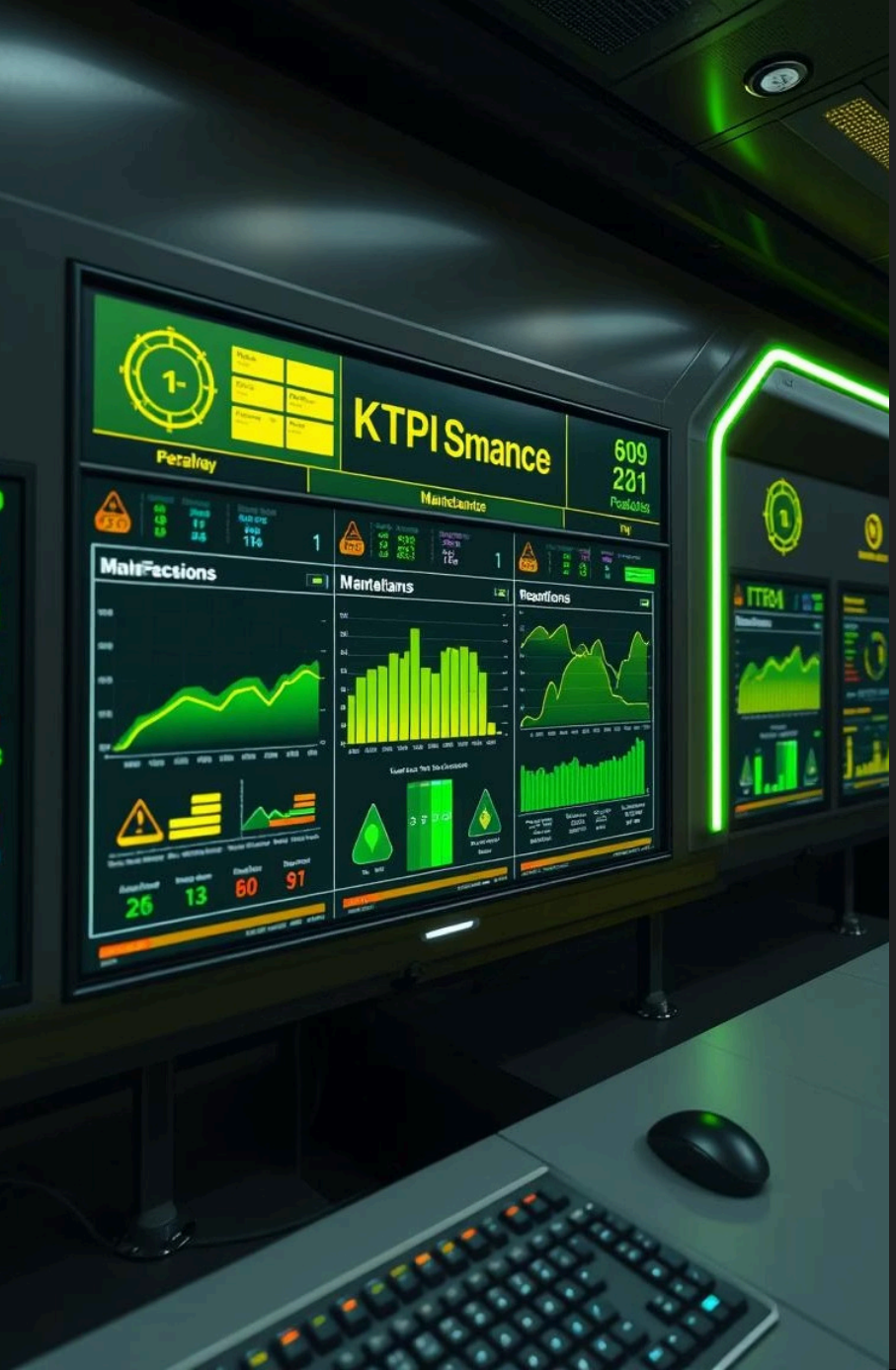
Maintain continuous, interruption-free service.

Extend Asset Life

Preserve infrastructure and rolling stock durability.

Optimize Costs

Apply efficient maintenance strategies to reduce expenses.



Key Performance Indicators (KPIs)

99.8%

Track Availability

Percentage of time tracks are operational.

95%

On-time Maintenance

Percentage of scheduled tasks completed timely.

5%

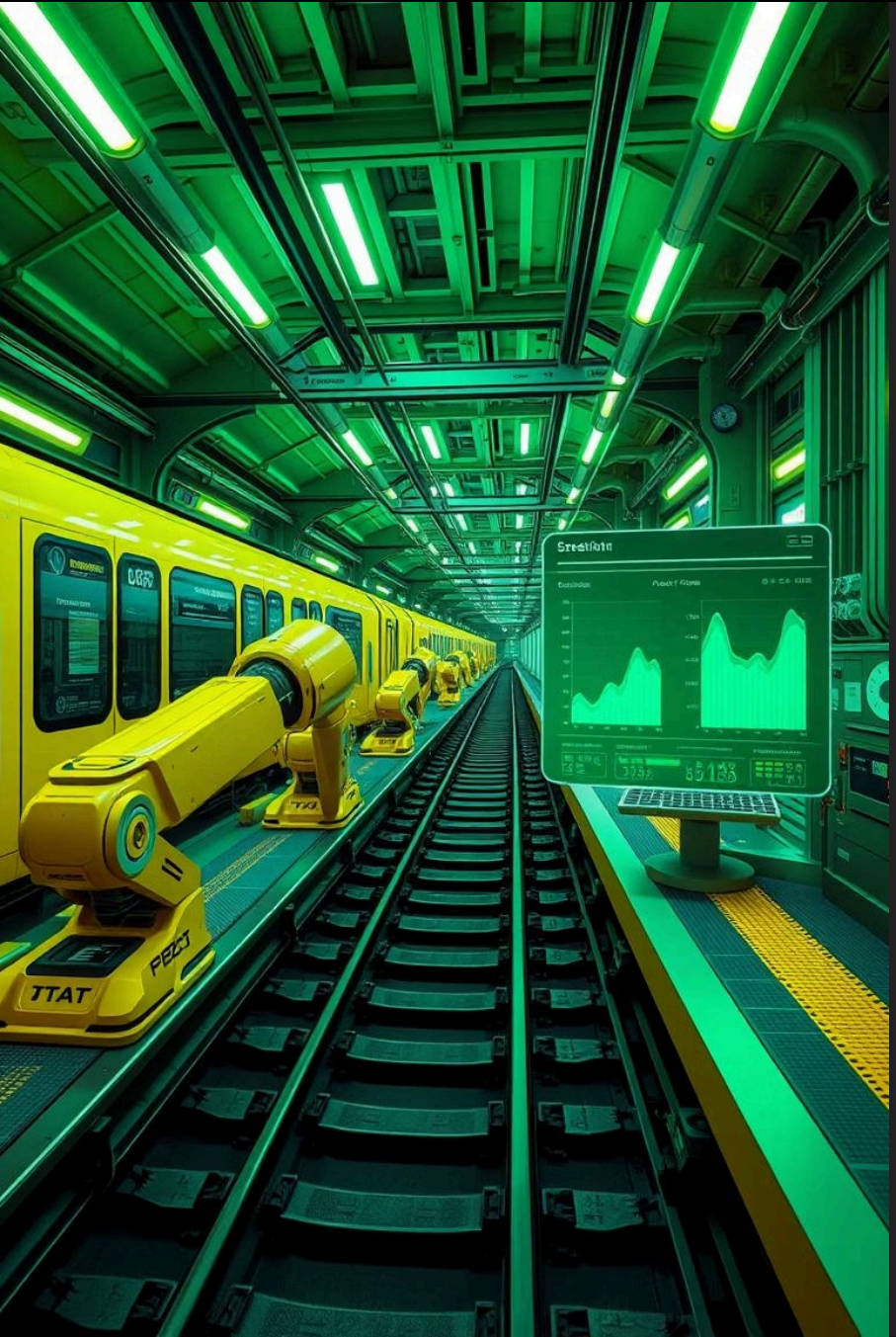
Failure Rate

Percentage of equipment failures per operational hours.

20%

Cost Reduction

Improvement in maintenance efficiency year-over-year.



Future Trends in Railway Maintenance

Automation

Robots to perform inspections and repairs.

Big Data

Analyze operation data for predictive actions.

Cloud Systems

Centralize maintenance records and analytics.

Energy Efficiency

Use sustainable energy in maintenance operations.