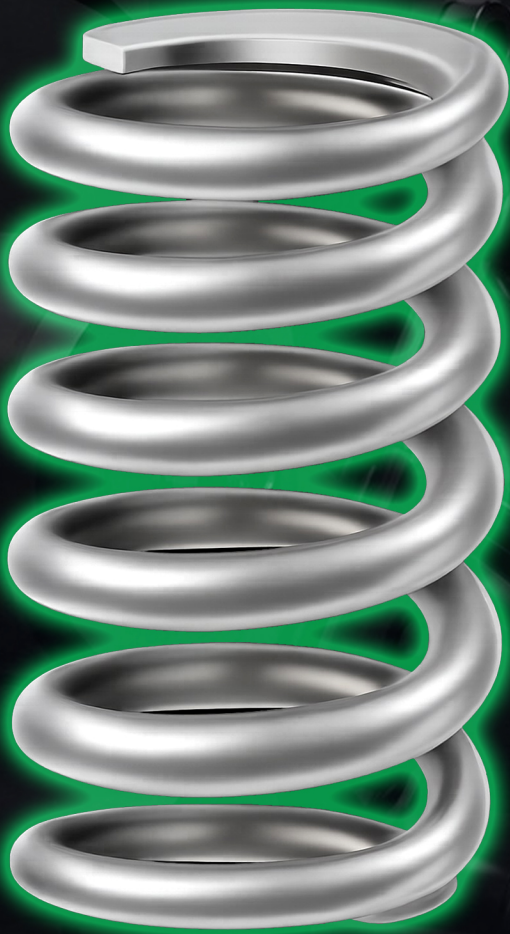




Topgrip
Instruments Company

AI based Crack Detection of Springs

of LHB, ICF Coaches, Locomotives and Wagons



We are
IATF 16949:2016, AS9100D,
D-U-N-S & ISO Certified Company



www.topgripinst.com



CRACK DETECTION SYSTEM

SPRING (SPRIC) CRACK ANALYSIS

System Status ● Online
Active Alarms ▲ 3
20 May 2025 | 10:45:30
Admin ▼

Dashboard

Live View

Analysis

Results

Reports

Alarms 3

Data Management

System

User Management

Audit Log

Total Inspections

12,458

Today

Springs Inspected

1,248

Today

Cracks Detected

156

Today

Critical Cracks

14

Today

System Health

98%

Excellent

LIVE INSPECTION ● Running

Camera View

SPRING ID : SPR-25-05-20-00454

CAM-02

Processed View

AI Confidence: 96%

CRACK ANALYSIS Latest Result ▼

SPRING ID : SPR-25-05-20-00454

Crack Type	Spiral Crack	Duration	12.45 mm
Severity	High	Width	0.38 mm
Location	Outer 5	AI Confidence	96% (±1)
Notes	Spiral crack detected in the outer coil section.		
Status	Reject		

INSPECTION SUMMARY (Today)

1,248

● OK 1,092 (87.5%)

● Minor 86 (6.9%)

● Major 94 (4.5%)

● Critical 14 (1.1%)

CRACK TREND (Last 7 Days)

● Total Cracks ● Major Cracks ● Critical Cracks

CRACK DISTRIBUTION (By Location)

Location	No. of Cracks
Outer Coil	86
Inner Coil	34
Top Surface	18
Bottom Surface	10
End Zone	8

RECENT INSPECTIONS

Time	Spring ID	Camera	Result	Crack Type	Severity	Length (mm)	AI Confidence	Image
10:45:12	SPR-25-05-20-00454	CAM-02	Reject	Spiral Crack	High	12.45	96%	
10:44:36	SPR-25-05-20-00455	CAM-01	OK	-	-	-	-	
10:43:56	SPR-25-05-20-00454	CAM-03	Minor	Surface Crack	Minor	3.21	91%	
10:43:20	SPR-25-05-20-00453	CAM-02	Reject	Spiral Crack	Critical	18.67	97%	

ALERTS & NOTIFICATIONS View All

- ▲ Critical crack detected in SPR-25-05-20-00454 10:45:12
- ▲ High severity crack detected in SPR-25-05-20-00453 10:43:20
- ▲ System calibration due for CAM-03 10:40:15
- i Daily report generated successfully 10:30:01

CRACK DETECTION SYSTEM FOR RAILWAYS

HIGH-LEVEL SYSTEM ARCHITECTURE

FIELD / INSPECTION AREA
(Up to 11 Machines)

MACHINE 1

- High Resolution Ethernet Camera
- UV Lamp / Light Arrangement

MACHINE 2

- High Resolution Ethernet Camera
- UV Lamp / Light Arrangement

...

MACHINE 11

- High Resolution Ethernet Camera
- UV Lamp / Light Arrangement

Other Field Components
Sensors (of any), Trigger, Encoders, Safety Interlocks, etc.

NETWORK INFRASTRUCTURE

Industrial Ethernet Switches

- Managed Switches
- Reliable Industrial Grade
- Redundancy (Optional)

CENTRAL PROCESSING & STORAGE

Workstation (AI / GPU Ready)

- Image Acquisition from Multiple Cameras
- AI-based Crack Detection
- Image Processing & Analysis
- Data Management
- Result Generation

Storage

- Image & Result Storage
- Database
- Backup & Archive

REPORTING & NOTIFICATION

Reporting

- Automated Reports
- Customizable Reports
- Data Export (CSV/PDF)
- Historical Data Retrieval

Notification (Email)

- Real-time Alerts
- Email Notifications
- Configurable Triggers
- Event Summary

OPERATOR INTERFACES

HMI STATION (LOCAL)
Industrial HMI – Touch Type

- Real-time Monitoring
- Alarm & Status
- Manual Review
- System Configuration
- User Management

ADDITIONAL OPERATOR / REVIEW STATIONS (OPTIONAL)

Operator / Review Stations

MULTIPLE NODES CAN BE SUPPORTED

- Architecture supports multiple inspection nodes at multiple locations
- Centralized monitoring, processing and data management
- Easy scalability for future expansion

LEGEND

- Ethernet / Data
- - - Control / I/O (if any)
- HMI / Display (Local)

KEY HIGHLIGHTS

- High Resolution Ethernet Camera with High Frame Rate
- UV Lighting for Enhanced Crack Visibility
- Industrial Ethernet Network for Reliable Communication
- AI / GPU Ready Workstation for Advanced Crack Detection
- Centralized Storage and Scalable Architecture
- Real-time Monitoring, Alerts & Reporting
- Email Notifications for Timely Alerts

* Diagram is indicative and for representation purpose only.



Introduction

As we know that in Indian Railway using spring set on Coaches, Wagons and Locomotive. During the movement/operation of trains the springs are absorbs the shocks, due to uneven shocks develops the cracks on the springs. When the Coaches, Wagons and Locomotives reach to depot for ROH/POH the springs are dismantle and go to check up than spring is load on a rotary Test Bed and spray magnetic powder mix with kerosene/Diesel and put the UV Light on the spring the cracks are glow on UV Light (Pictures are Enclosed).

Scope of Work

Identify the Cracks on springs with the Help of AI Based Intelligent observation System, provide the alerts and make database with Picture as well as sheet.

- Accuracy of the system.
- Automatic recognition of Spring's Crack.
- Produces a hard copy printed record of each Cycle including,
- Date and time of Detection.
- Total No. Cycle.
- Individual Springs Details (Pictures and Data).

Advantages of Using AI Based Crack Detection System

- Crack Detection is a crucial test for Springs by manual system when it will be detected by the AI System it maintains the data sheet for compression with past & future data.
- Helps to maintain the New Spring Inventory.
- No any place for human error.
- All data (Sheet and Picture) will gather a single Click.

System Specification

System having four Parts :

1. Camera System.
2. Work Station Hardware with Storage.
3. Software Platform.
4. Installation Part

Camera System

High-resolution industrial cameras for accurate defect detection.

- Support for high frame rate image capture to enable inspection of moving components.
- Ethernet-based connectivity for reliable data transmission and easy integration.
- Compatibility with UV-sensitive imaging for enhanced crack visibility under UV illumination.
- Support for macro lens attachments for close-range, high-detail inspection.
- Provision for UV bandpass filters to improve contrast and isolate relevant defect signatures.
- Designed for continuous operation in industrial environments.

Workstation Hardware with Storage (For Data Analytics)

- Centralized workstation for processing, analytics, and data storage.
- GPU-enabled system (AI-ready) to support image processing and defect detection workloads.
- Equipped with professional-grade GPU such as NVIDIA A4000 or equivalent.
- Adequate processing capability for handling data.
- Sufficient storage for image data, logs, and reports with provision for expansion.

Software Platform

- Centralized software for image acquisition, processing, and defect detection.
- Supports multiple camera inputs for simultaneous inspection across different stations.
- User-friendly interface for monitoring, visualization, and analysis.
- Integration with HMI systems for real-time monitoring and operator interaction.
- Compatible with other OT (Operational Technology) Systems for seamless data exchange and system interoperability.
- Supports data storage, reporting, and retrieval.
- Scalable architecture to support multiple inspection units and future expansion.

Installation Part





- Cabling
- Networking
- Electrical Wiring

AI make the **safety** with
precised assurance.



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