Case Study: Vision-Based Quality Inspection and Traceability System

Client Overview

Sharda Motors Industries Ltd is a leading automotive components manufacturer, known for its high standards in quality control and production efficiency. To enhance **process automation and traceability**, the company required an advanced **vision-based system** for ensuring **circlip presence verification** during assembly.

Project Summary

The **Vision-Based Quality Inspection and Traceability System** was implemented at **Sharda Motors Industries Ltd** to ensure accurate **circlip pressing** during production. This system integrates with **machine vision technology** and **IoT-based data acquisition** to enhance precision, reduce errors, and improve traceability.

Challenges Faced

- **Manual inspection inefficiencies** leading to incorrect circlip placement.
- **Production delays** due to idle machine time caused by rework.
- **Lack of traceability** of individual parts in the assembly line.
- **Quality inconsistencies** affecting compliance with industry standards.

Solution Implemented

The **Vision-Based Quality Inspection and Traceability System** was deployed to address these challenges by enabling:

1. Automated Circlip Presence Detection

- A **vision system** detects whether the **circlip is properly placed** on the part.
- If the circlip is detected, the system sends a **forward command** to the cylinder, allowing the circlip to be clipped onto the part.
- If the circlip is missing, the system prevents further machine operation, ensuring quality compliance.

2. QR Code Generation and Scanning for Traceability

- Once the circlip is successfully clipped, a **unique QR code** is generated containing:
  - **Unique ID**
  - **Date & Time**
  - **Part Details**
  - **Vendor Details**
  - **Shift Information**
  - **Production Count**
- The **QR code is printed and pasted on the part** to ensure traceability.

- Before the part is unclamped, the **QR code is scanned** to confirm all details are correctly registered in the system.
- Once validated, the **machine releases the part and is ready for the next cycle.**

3. Data Acquisition and Cloud-Based Traceability

- All **inspection data, QR codes, and production logs** are stored securely on the **cloud**.
- Data is **accessible in real time** via a **dedicated URL** for production monitoring.
- **Daily production analysis reports** are emailed to **registered recipients**.
- **Quality reports, production reports, and maintenance alerts** are shared via **email and mobile notifications**.

Key Business Impact

1. Increased Production Efficiency

- **Machine idle time was reduced by 1 hour and 50 minutes**, leading to a significant boost in production output.

2. Reduction in Rework & Quality Issues

- The vision-based system eliminated manual inspection errors, ensuring **100% accurate circlip placement**.

3. Enhanced Traceability & Compliance

- Each part is now uniquely identified with a **QR code**, ensuring full traceability throughout the supply chain.

4. Real-Time Data Access & Decision Making

- **Management teams** can access reports anytime from **any location**, enabling **data-driven decisions**.
- **Automated alerts** improve **response time** to production or maintenance issues.

Conclusion

The **Vision-Based Quality Inspection and Traceability System** at **Sharda Motors Industries Ltd** has significantly improved **production efficiency, traceability, and quality assurance**. By leveraging **machine vision technology, IoT, and cloud-based data management**, Sharda Motors has successfully **optimized machine uptime, reduced errors, and enhanced production workflows**.

This successful implementation highlights how **vision-based automation** can revolutionize **quality control** in **automotive manufacturing** by eliminating manual errors and increasing process efficiency.