Tyre Bead Testing (Tyre Industry)

Client Background

The client is the world's largest manufacturer of tyres and rubber products, and a preferred OEM supplier to major car manufacturers in India. Renowned for its quality and innovation, the company leads the global market in tire technology and manufacturing excellence.

Tyre Bead Testing provides the industrial solution for measurement of bead for Tyre bead-rubber strip. Vision based system that can capture the image of Tyre bead and is processed through various algorithms and generates the profile which contains the vital information that is used to correct the Tyre bead into target production.

Challenge

The primary challenge of bead measurement on the production line is that the bead rubber strip is hot, shiny, and black, all of which result in poor and inconsistent reflectivity. Additionally, identifying a millimetre-level bead from the strip and deciding when to trigger an alarm is difficult. During the process, the speed of the tire strip varies by up to centimetres per second. This process needs to be repeatable and requires building a real-time system with millimetre-level accuracy for surface profiling of the tire bead strip.

Engagement Journey

Started With

Extended To

Ongoing Support

Solution

By integrating real-time modular hardware, a vision-based camera, and advanced application software, a cutting-edge system was developed for bead measurement and decision-making. This system significantly enhances high-fidelity data collection, reduces human errors, and automates calculations and report generation. The result is a marked improvement in both efficiency and profitability. The machine can measure the length of the strip with millimetre-level accuracy, ensuring precise and reliable results. This innovative approach not only streamlines the production process but also provides a robust solution to the challenges of bead measurement on the production line.
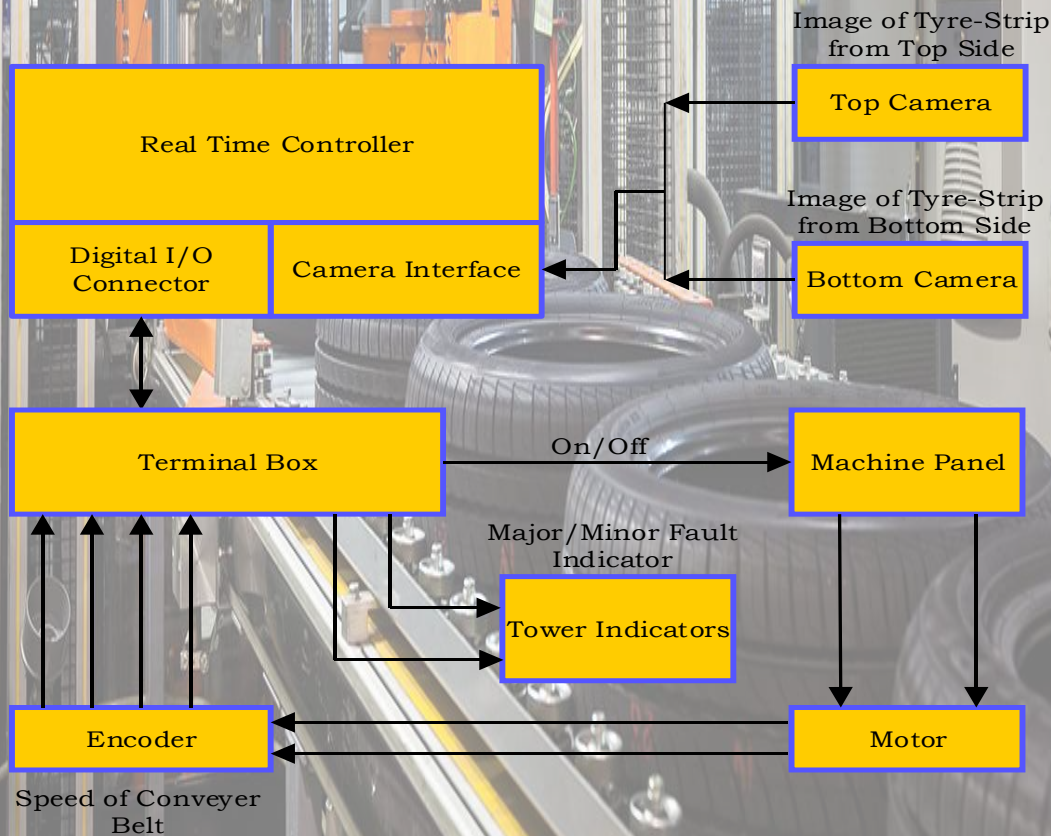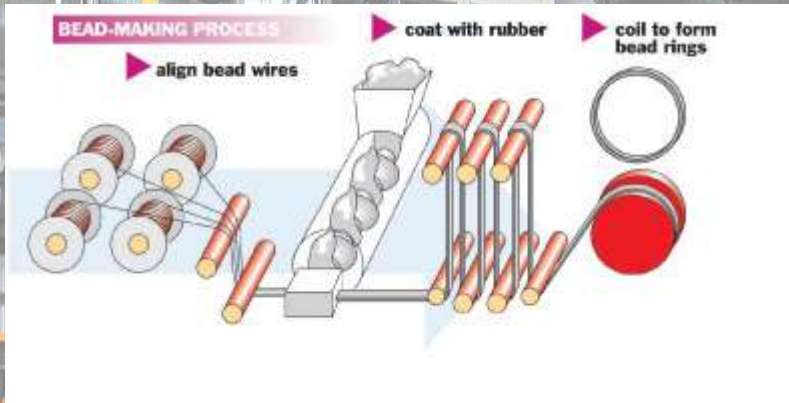
Solution

In the figure for the bead-making process, it is observed that bead (copper-coated) wires are coated with rubber. However, sometimes these bead wires are not perfectly coated with rubber. To find these uncoated bead wires, there are two cameras in this system to detect beads from the top and bottom sides. The cameras can take an image in less than a millisecond and pass all image data to a real-time controller.

The controller performs image acquisition, image processing, calculation, and decision-making. The decision-making process can identify major faults, minor faults, and system faults. The real-time application processes image data according to a written algorithm to measure the bead of the tire bead rubber strip. The report generation produces a report file containing error data (bead length), the time of occurrence (date and time), and the machine status.
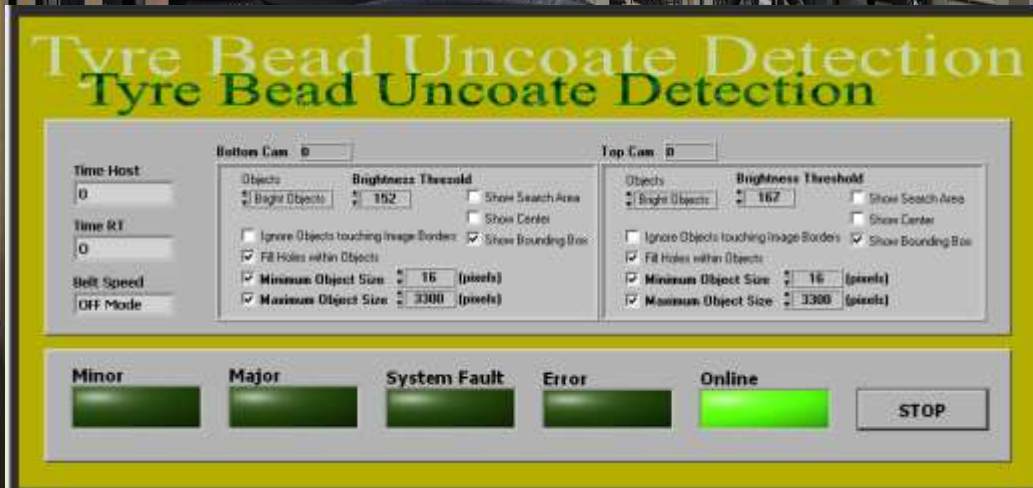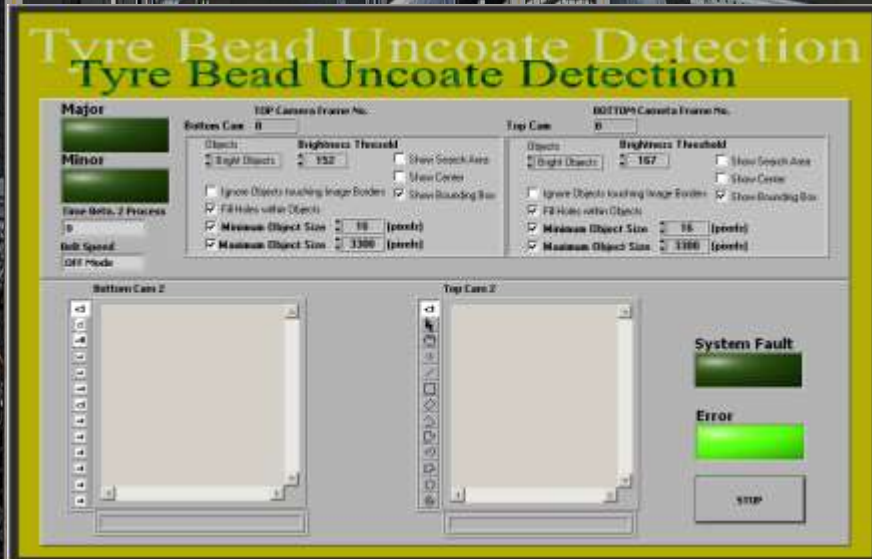
Benefits

- Achieves critical production objectives with millimetre-level accuracy
- Ensures high-quality and reliable output
- Automates the inspection process, reducing labour costs and time
- Increases production speed and consistency
- Minimizes defects through precise, real-time detection
- Improves overall efficiency and profitability
- Enhances traceability with detailed reporting
- Supports continuous improvement efforts
- Delivers cost savings
- Boosts operational efficiency
- Maintains stringent quality standards, providing a competitive advantage in the market

Benefits against alternatives

An automated industrial testing solution offers significant advantages over manual operations reliant on human interface. By replacing manual processes with automation, the system effectively reduces the likelihood of human errors, ensuring higher accuracy and reliability in production. Additionally, the automated solution saves valuable time by streamlining operations and eliminating the need for manual intervention at various stages of testing. This not only enhances efficiency but also allows for faster turnaround times, ultimately leading to increased productivity and output. Compared to traditional manual methods, the automated industrial test solution not only mitigates the risk of errors but also optimizes time utilization, making it a superior choice for achieving production targets efficiently and effectively.

Value Proposition

Optimized Solutions built a fully automated Tyre bead Detection system using the latest machine vision technology. We used custom-built, self-adapting algorithms to ensure reliable inspection irrespective of the wide variations in the components. Our system gives our customer complete flexibility in choosing both which features are inspected and the inspection criteria, so it is very easy to change from one model to another.