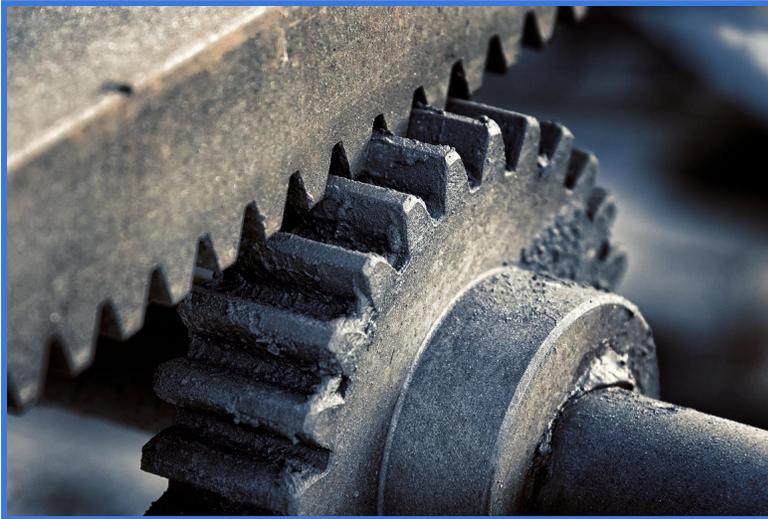


USE CASE

GEAR INSPECTION - SURFACE CHECK OF TEETH



CLIENT/INDUSTRY BACKGROUND

Our client caters to the full-service line of Industrial Automation needs of Indian & ASEAN manufacturing industries. Our core focus is to be a system integrator and play a pivotal role in Industrial Automation. They provide complete, end-to-end

Industrial Automation Solutions that enable companies in the discrete manufacturing sector to be automated, digitized, and smart.

Gear teeth are meshed with another toothed part to transmit torque. Geared devices can change the speed, torque, and direction of a power source

PROBLEMS

- Defects like poor surface finish, uneven surface, deep scratches, cracks, etc, introduced while gear hobbing are being falsely accepted during the inspection
- Inspection of all the surfaces of the gears is not possible and hence only the flank surfaces, which are 90 degrees apart are being inspected
- Production rate is way ahead of inspection cycle time causing a large number of defective pieces are being accepted without inspection

PROBLEM IMPLICATIONS

- Gears with surface defects on their teeth have low wear strength and hence they may result in early failure
- Gear fatigue is one of the outcomes of defective gears in operations
- Gear slip may occur
- Less gear being inspected cause a large number of defective gears being shipped

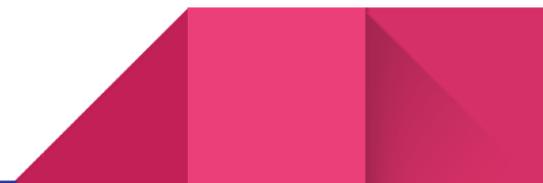
CLIENT REQUIREMENTS

- To automate the inspection process of gear teeth surface to reduce/eliminate the false acceptance rate
- More than 100 types of gears have to be inspected
- Inspect a higher number of gears with high accuracy

CURRENT PROCESS

The inspection is being done manually by operators -

- Only a few gears from each batch are being inspected with the help of gear testing machines



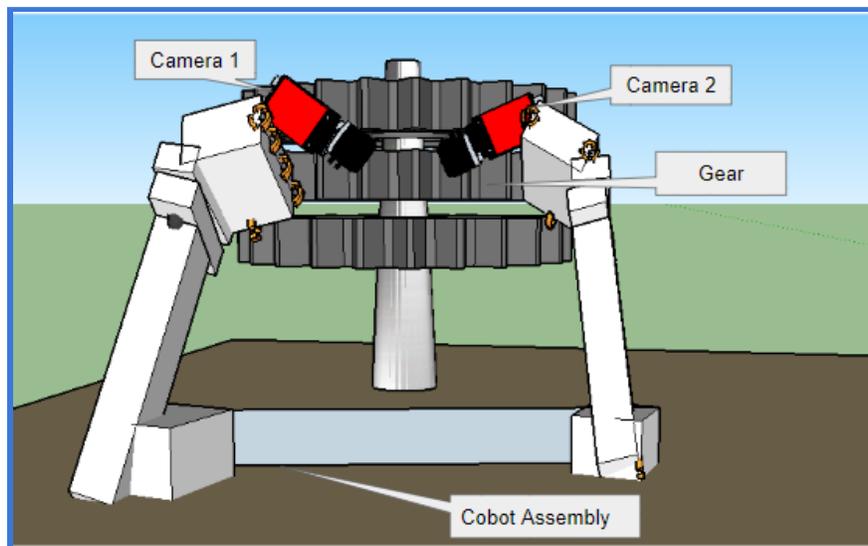
BUSINESS IMPACT

1. Decrease in profitability
2. Increase in Cost Of Quality

SOLUTION USING MACHINE VISION AND AI

The gear will be placed in a stacked way and each tooth will be shown to the camera through a rotating mechanism. The cameras along with illumination aiding devices will be placed in different orientations at an angle along all the two surfaces to capture the image without any distortion.

SETUP CONCEPT

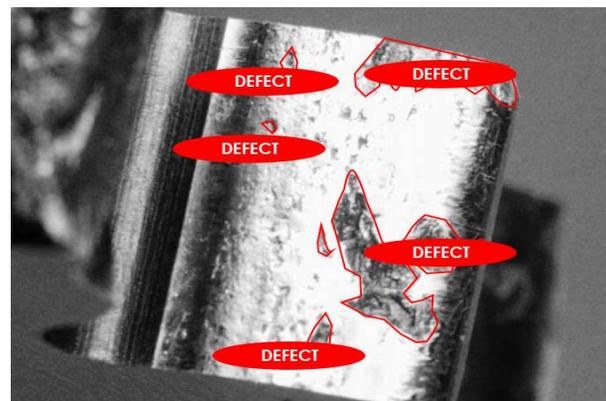
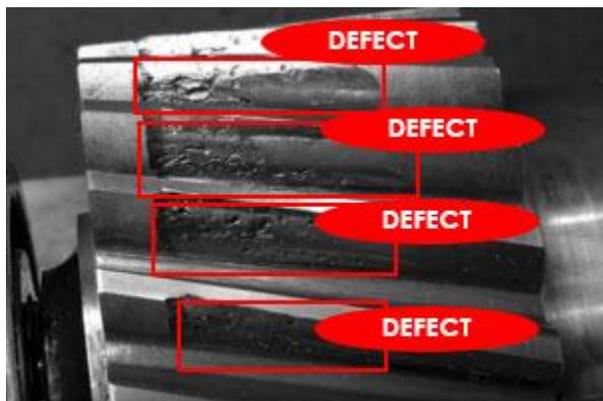


Images are captured and sent to the software (Qualitas EagleEye® Platform) cloud where the training is done using the DL algorithm. Once the program is trained, real-time defect detection takes place, based on which the results are sent to PLC to take action.

The AI-based Anomaly detection technique is used to correctly examine the gear teeth for surface defects.

IMAGES

QEP(QUALITAS EAGLE-EYE® PLATFORM)ANNOTATED IMAGES



CONCLUSION

POC(Proof Of Concept) is conducted and the following conclusion is observed:

1. The accuracy of defect identification is ~ 98%
2. Increase in the number of gear to be inspected as the inspection cycle time is reduced to 3 seconds
3. The false acceptance rate has been reduced to ~ 3%



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