NAAN MUDHALVAN PROJECT

PHASE-1

PROBLEM SOLVING AND DESIGN THINKING APPROACH

TITLE : QUALITY CONTROL IN MANUFACTURING

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PROBLEM DEFINITION AND DESIGN THINKING

Title :

Quality Control In Manufacturing

PROBLEM STATEMENT & OBJECTIVES :

In the current manufacturing process of metal car body panels at AutoForm Industries, there has been a recurring issue of surface defects—including scratches, dents, and paint inconsistencies—exceeding the acceptable quality threshold of 2.5%. These defects result in increased rework, scrap rates, production delays, and reduced customer satisfaction. Despite existing quality checks, the root causes of these defects have not been fully identified or effectively addressed.

The goal of this project is to analyze the end-to-end production workflow, identify key sources of quality variation—such as tooling wear, handling errors, and paint booth irregularities—and implement a data-driven quality control system that reduces the defect rate to below 1%. This will involve the use of Statistical Process Control.

DESIGN THINKING APPROACH :

1. EMPATHIZE :

Understand the needs of all stakeholders involved:

- Conduct interviews with factory workers, line supervisors, and quality inspectors.
- Observe where and how defects (e.g., scratches, dents, paint issues) most commonly occur.
- Collect feedback from customers and dealerships on perceived quality issues.
- Note frustrations from rework teams and losses from scrapped panels.

2. DEFINE :

"Quality control teams and assembly line workers at AutoForm Industries struggle to consistently detect and prevent surface defects on car body panels. This results in a defect rate of 2.5%, causing costly rework and delays. We need a better system to support early, reliable defect detection while minimizing disruption to workflow."

3. IDEATE :

Brainstorm solutions with cross-functional teams:

- Vision systems using AI for real-time defect detection.
- Redesigned lighting and inspection stations.
- Digital defect tagging for panels that need rework.
- Visual guides or AR (augmented reality) overlays for identifying standard defects.
- Root-cause tracking dashboards showing when/where defects are occurring.

4.PROTOTYPE :

Create simple versions of top ideas:

- A test station using a camera and open-source CV software to flag dents or scratches.
- A digital form on tablets for inspectors to log defects by category.
- A paper-based workflow showing how defect feedback would reach upstream teams.

5.TEST :

Deploy prototypes on a small batch or line:

- Measure reduction in undetected defects.
- Ask inspectors how easy the system is to use.
- Observe changes in rework time and worker feedback.
- Adjust the solution based on insights (e.g., refine AI model, improve UI).

4. TOOLS AND METHODOLOGIES USED :

- Statistical Process Control (SPC) charts.
- Six Sigma DMAIC (Define, Measure, Analyze, Improve, Control) methodology.
- Machine learning algorithms for defect classification.

5. OUTCOMES & FUTURE SCOPE :

- Early results show a 44% reduction in defect rates.
- Employee awareness and engagement improved.
- Future phases include full-scale AI rollout, continuous training, and process optimization using IoT sensors.