



Design & Development of an Automation Machine for Electronic Product Testing

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Introduction

Sony is known for top-quality products. As third-party manufacturing contracts grow, quality assurance is crucial, involving Non-Value-Added (NVA) tasks such as "Testing" that consume time, resources, and effort without adding value to the product. Manual testing of "Product A," an Electronic Circuit Board, decreases efficiency and profits while increasing costs.

Project Aims

The project aims to create an Automated System Solution for Product A Testing to mitigate NVA tasks by completing the following:

- Design an Automated Machine utilising Computer Aided Design (CAD) software.
- Develop the Automated Machine by creating Engineering Drawings.
- Assemble, and program the machine to perform Product Testing, ensuring user-friendly operator interaction.
- Commission the Automated Machine, ensuring integration with the previous production process.

Methodology

The methods utilised to design and develop the automated system are:

- **Design Specification:** Outlines key objectives, requirements, and constraints formulated from a Design Brief.
- **SolidWorks:** Used for 3D modelling, simulation, and optimisation.
- **Design for X Techniques:** Ensures considerations for manufacturing, assembly, maintainability, and more.
- **General Engineering Knowledge:** Informed design and decision-making processes.

Results

Design & Development: The automated system handles Product A's process. Feeders move the Product to Gantry systems for placement in Test Jigs. Post-test, the Gantry relocates the Product to output systems for packing or rework based on test outcomes.

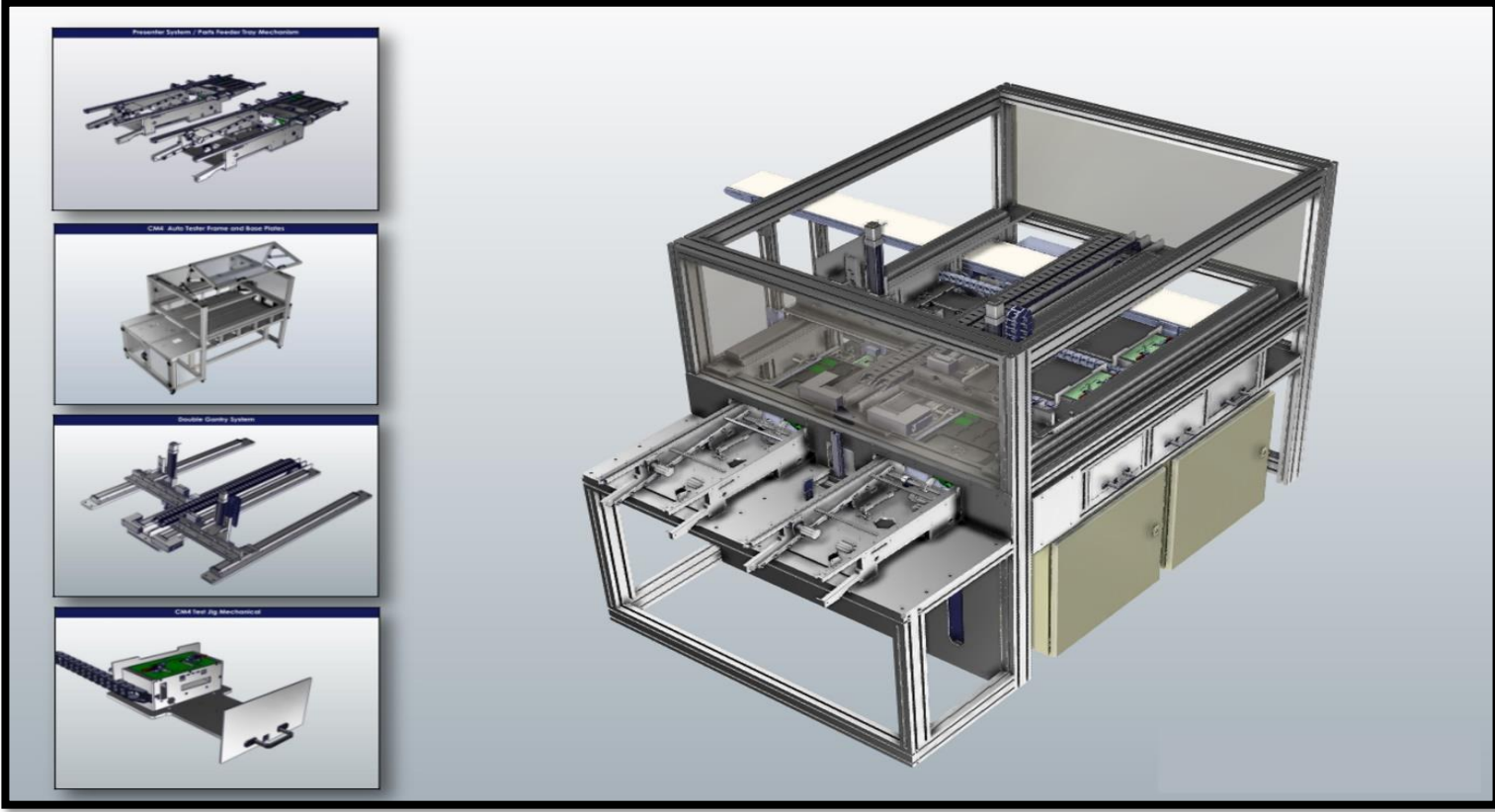


Figure 1. Full Automation Machine Design with Subsystems



Figure 2. Automation Machine Integrated into the Production Line

Outcome:

- **Initial Offline Trials:** 7,349 Boards (Product A)/week → 11,947 Boards/week (After FMEA led to machine modifications).
- **Initial Production Trials:** 7,095 Boards/week → 9,385 Boards/week (After completing a problem analysis, leading to further modifications).
- **Calculated Machine Efficiency:** 67.57%.
- **Calculated Average Output Based on Efficiency:** 9,304 Boards/week.

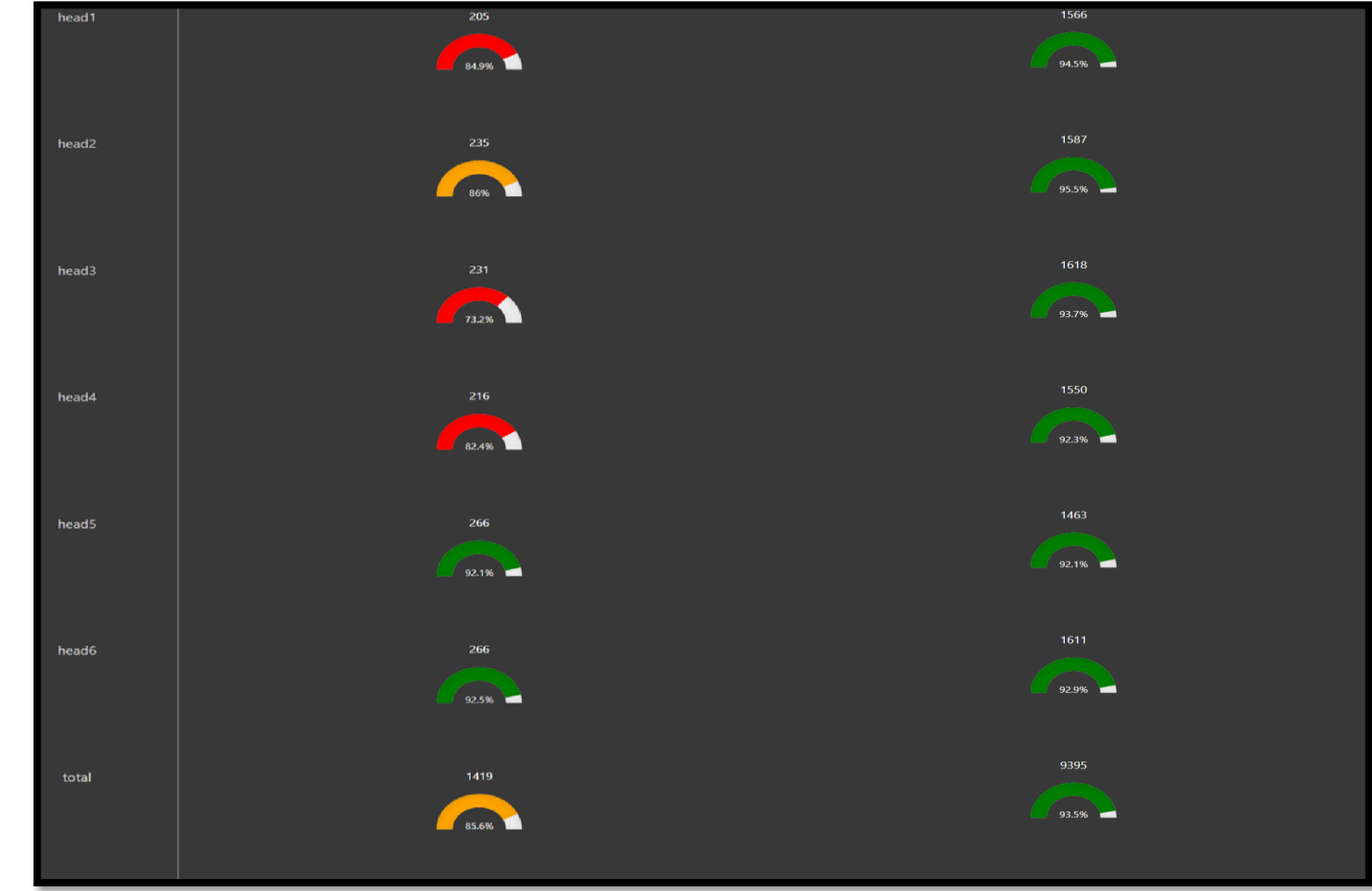
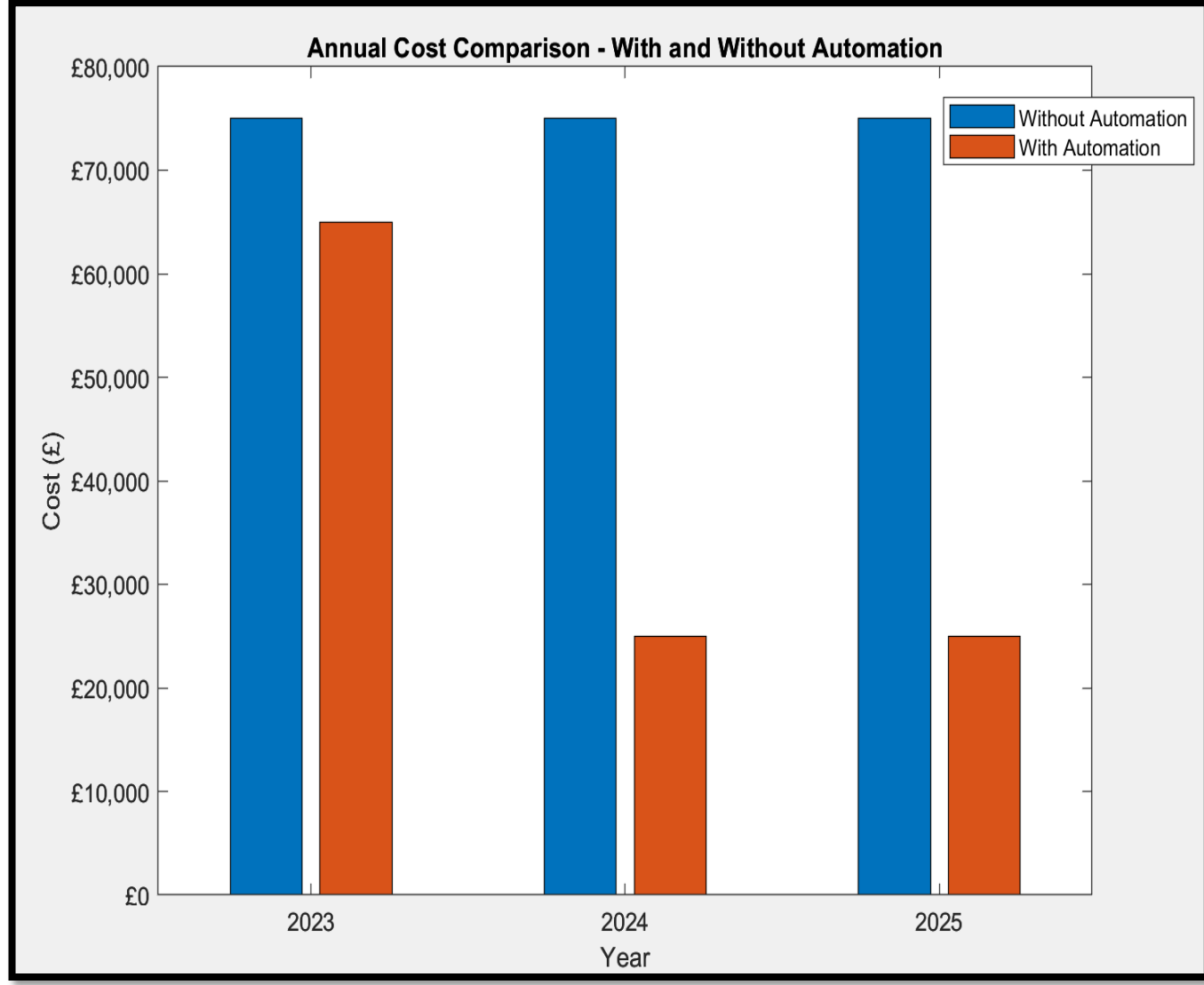


Figure 3. First-Time Yield and Production Output Before (Left) and After (Right) Modifications

Outcome Continued: Graph 1 compares manual and automated testing of Product A for the required output.

- **Design Brief Requirement:** 9,000 Boards tested and outputted per week.
- **Machine Output:** >9,000 per week.
- **Machine Cost:** ~£40,000.
- **Return on Investment:** Less than one year.



Graph 1. Annual Cost Comparison over Three years, with and without Automation

Conclusions

Although the machine operates at 67.57% efficiency, it achieves the production target while being £10,000 below the set budget, saving £50,000 annually. This project demonstrates the importance of automation in the UK, mitigating Non-Value-Added tasks and fostering employee growth. Savings enable employee development and Product cost reduction, benefiting the company and employees and maintaining UK competitiveness in manufacturing.

Further Work & Recommendations

Future designs should prioritise sustainability, considering energy efficiency and recycled materials. Additionally, enhancing product scanning systems and adding a Gantry in the same workspace to reduce pick-and-place times could increase machine efficiency to approximately 79%.