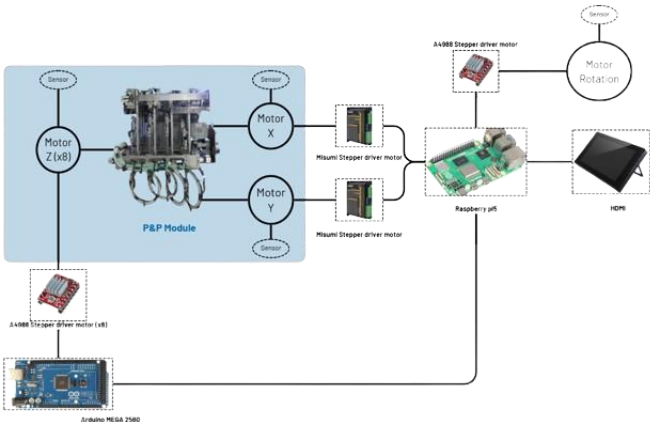
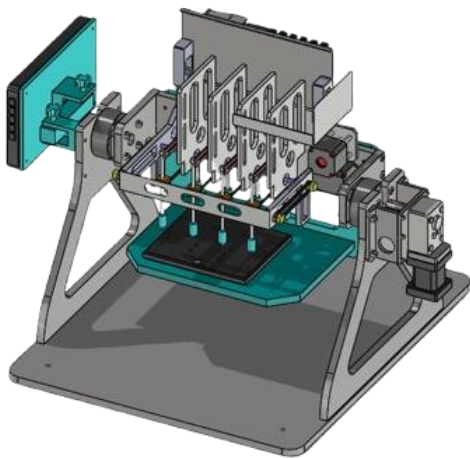


Abstract

The HT9046-MX machine is a transport system equipped with a suction-based Pick & Place (P&P) module for handling workpieces. Regular preventive maintenance (PM) is performed every six months, focusing on inspecting the module, cleaning the bearings, and performing teaching. However, limited workspace poses challenges, making maintenance time-consuming and inefficient.

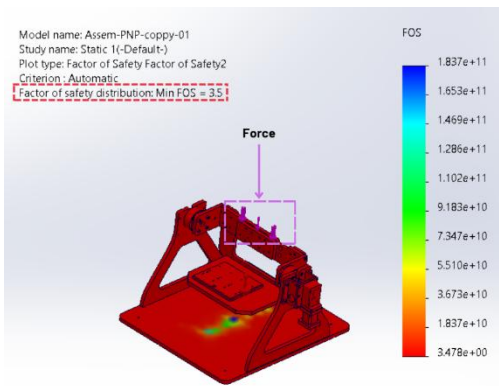
A key issue is the prolonged downtime caused by restricted access to critical parts, especially during cleaning and teaching. The confined space makes it difficult for technicians to perform necessary tasks effectively, leading to delays in maintenance procedures. Addressing these challenges is crucial for improving machine uptime and operational efficiency.

To optimize maintenance, this project introduces a specialized tool designed to assist with both cleaning and teaching processes. The tool aims to enhance technician efficiency, reduce the time required for instructions, and ultimately decrease P&P module maintenance time by 12%.

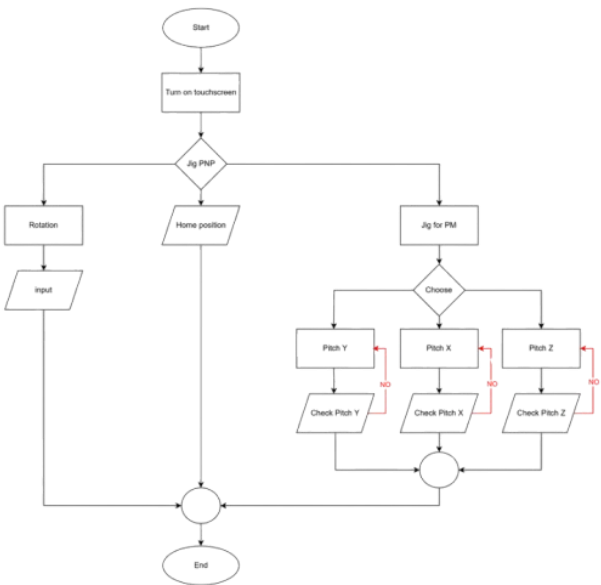


Results and Discussion

The automated P&P system improves positioning accuracy and reduces human error. A Factor of Safety (FOS) of 3.5 ensures structural reliability. Step sizes down to 1 mm enable precise placement, and the homing function increases setup efficiency. Clamp sensors and stable motor control contribute to consistent operation.



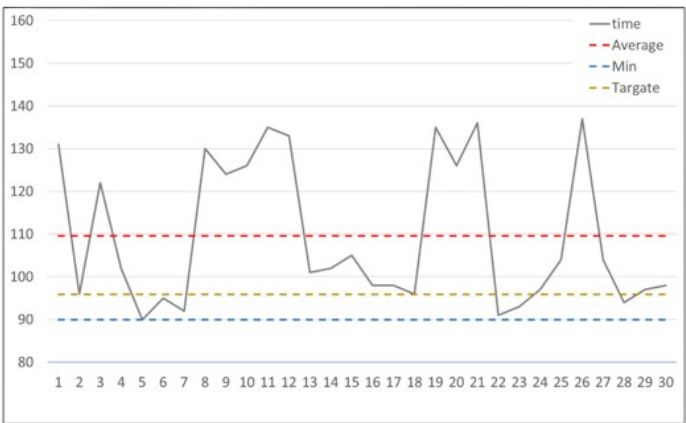
Experimental



A redesigned Pick & Place (P&P) system was developed to replace a manual setup with a more precise, automated version. The new system includes a Teaching Jig for easier calibration and maintenance. Python (via Thonny) and Arduino MEGA 2560 were used to control motors responsible for rotation and movement along X, Y, and Z axes. Components include Misumi stepper motors, A4988 drivers, and clamp sensors for object detection.

Conclusion

The upgraded P&P system offers a cost-effective, automated solution with enhanced precision and ease of use. It is suitable for industrial applications that demand repetitive, accurate motion, all within a total system cost of \$489.213.



Parameter	Time(min)
Max	137
Min	90
Average	109.6
70% Entitlement	13.72
Target	95.9

Acknowledgement

This project will not be accomplished without help and support from the following team /people in ADTH

Project Sponsor : Nuttapong K. – Manufacturing Director
Project Owner : Amornthep H./Udon B. - Manager
Project Mentor : Natthachat S.