

## SUMMARY

This thesis concentrates on manufacturing the battery packs at Starship Technologies, which offers delivery robot services. The thesis main goals are to improve the productivity rate, cycle time, and utilization of the battery packs production and solve the issues encountered by the manufacturing (employees and managers). The data were collected twice: from the company by process engineers and the author by observation of the production line, and then the data were compared. After observing the current system and analyzing the data, several bottlenecks were found and solved in the paper.

The average time between the company and author was taken into account, and the current layout was simulated using Tecnomatix Plant Simulation. The results from the simulation as-is validate the actual results from the company, which allows the author to apply the suggested improvements to the simulation as different scenarios to show the validity of the improvements and suggest the best outcome for the company in the current state. For example, the new suggested systems could increase the production rate from 142% to 700%.

The main improvements proposed in this thesis are the following (not in the order of importance): a new welding machine as it significantly decreases the time required for one of the most time-consuming processes in battery assembly. Three different solutions were considered, and the most suitable machine was proposed. Second, two new stations (assembling the cells and a second assembly station) as they increase manufacturing capacity and matching of the high production rate for the new improvements. Third, modification of the plastic molding dies to guide the employee's soldering spots, decreasing human error. Fourth, ergonomic chairs as it significantly decreases back pain and sick days. A new product design for picking up the cells (Magnetic handler) and helping to assemble the cells was chosen to decrease the time out of the two proposed solutions. Fourth, plastic clamps align the screw holes together at once, making the processes more efficient. Again, three different solutions were considered, and the most suitable tool was chosen. Lastly, outsourcing time-consuming's tasks to the suppliers enables the company to reduce labor costs, improve manufacturing's focus on core processes, and utilize internal resources more effectively and efficiently.

The suggested scenario improved the production by 257% more than the current system and savings of 3100 euros per month with a payback of a year from the implementation date (the actual results could be better, but there is a limitation according to confidentiality reasons).

In conclusion, the company and the author are satisfied with the results. The objective of the thesis was successful in detecting and solving the most major production-related bottlenecks. Furthermore, the solutions for the problems are independent of each other; the company could choose what could be implemented right now and what will be implemented in the future with a given overview of the possibility of improving the system. In the end, continuous improvement and optimization of the production are needed, which future researchers could carry out.