# SUMMARY

The purpose of the master's thesis Reusable packaging reverse vending machine production planning and optimisation is to plan, optimise and analyse the production of Cuploop's reverse vending machine.

Cuploop's machine helps to collect reusable packages easily and pay back the deposit for the package fast and conveniently without another app. The generation 1.5 machines are more reliable, durable, easier to maintain and repair, and faster to assemble compared to the prototype version called generation 1. Moreover, the machines are very modular and, depending on the client's needs fully stacked, without a terminal, without RFID, without terminal and RFID. The software helps to have an overview of the machine, but moreover of the packages that are RFID-tagged. Since each package has a unique number, the tags can be tracked where they are in the chain – chain; warehouse, clients' restaurant/shop, in use, in a machine, on the way to wash etc. This will give big data that is generalised and provides insight into consumer habits and peoples' behaviour.

The electronics module workflow was simulated with three different scenarios using a program Visual Components. First was a simulation with one worker who could manufacture one module a day. The second simulation was with three workers, each one module a day with a total of three modules. Third simulation was with three workers with different tasks. Two were doing assembly, and one worker was assisting. Three workers with different tasks manufactured a total of four modules in a day. The simulation concluded that to increase production, it is most optimal to use three workers who do different tasks.

Four key process indicators are suggested to assess, track and analyse if set targets are being met. Production volume was chosen to prepare manufacturing resources in case demand rises. Unit cost calculations show that company is manufacturing at an acceptable cost, with which it can earn a profit. On-time delivery focuses on identifying possible risks, assessing and mapping them and also gives mitigation possibilities. It was found that the most critical aspect of on-time delivery is the contractor's and supplier's ability to adhere to promised delivery times and the availability of raw material. Right the first time focuses on manufacturing without defects and eliminating rework. Proper production instructions, thorough training and well-designed components that can be assembled quickly are essential for producing correctly the first time.

Production planning helps ensure that necessary resources and inventory is available when needed. The author of the thesis suggests the resources are used depending on the demand. The optimal order batch size is 20, which is found depending on the unit price, the capacity of the warehouse and the use of resources.

Lean focuses on value creation and, in connection with this, continuous optimisation of activities and processes. One of the most imperative improvements in manufacturing would be if the exchange of information would move electronically through MRP and ERP platforms. Secondly, creating a work environment that is convenient and safe to use while making production operations more effective.

The objectives of the thesis were met. The current production situation was described and simulated, new solutions were visualised, and the most optimal solution was found. The most effective way to increase production volume is to have three workers, of whom two are assemblers and one is an assistant. The risk analysis concluded that contractors' and suppliers' ability to deliver on time is a great threat to on-time delivery. The thesis author highly suggests that Cuploop invest in ERP and MRP to mitigate risks, which will help measure, analyse, and track different KPIs and overview resource availability.