Interreg North-West Europe
COTEMACO
European Regional Development Fund

Success Story

Feasibility for the Automated Chicory Roots Palletizing

EndiPro, BEL

Automated Chicory Roots Palletizing

Company description

Endipro is an SME in Ardooie, Belgium focusing on the growth of witloof vegetables. In 1989, Marnick, along with his wife Maddy, took over the company from his father. Marnick is already the sixth generation at the company. As one of the last growers in West Flanders, he started with chicory. Before that it was a mixed company, with pigs, cows (dairy and beef cattle), coal, lettuce and leek. They gradually evolved to the main chicory crop. Until 2008 Marnick and Maddy grew chicory on racks (hydroculture). Through this system, insert the chicory roots and harvest chicory while on the ground could be continued. Because this system was unsustainable in an extension, the couple worked a five years on another company. At that company, only the shed and the cooling installations were used.

Motivation and challenges

The chicory roots go through a series of steps before they are being stored in cooling warehouse to further grow into the chicory witloof. These steps include sorting, palletizing and storage. This report discusses the steps related to sorting and palletizing.

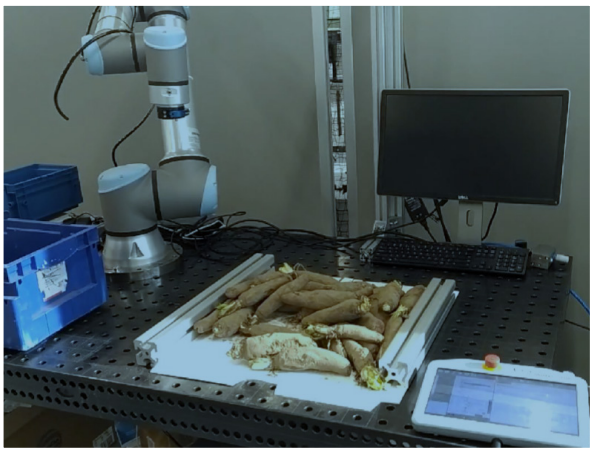
The current process at Endipro is manual. Basically, the process is not ergonomic and also it is tedious and labor intensive due to the repetitive tasks that operators need to perform. Therefore, the Endipro considers automating this process to not only reduce the risk for the operators and improve their working conditions but also reducing the manual labor to increase the overall production efficiency.

Technical solution

The proposed feasibility study was to explore the following needs:

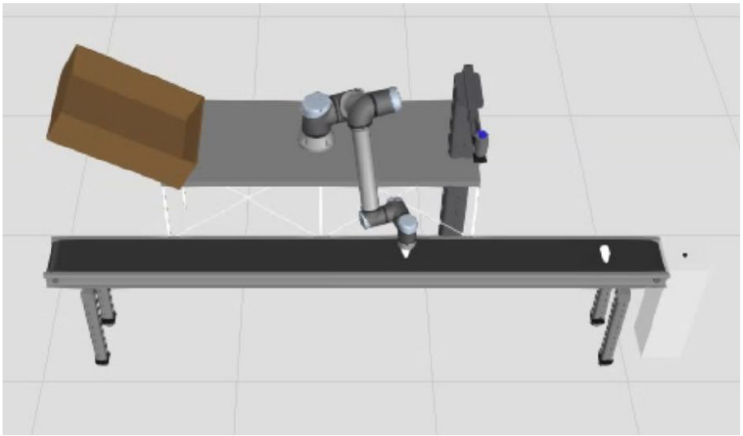
- Feeder system to facilitate the automated palletizing of the roots
- Sorting of the roots to discard and filter bad roots before palletizing
- Automated pick and place of the good roots in the pallets

Before the proposition of the below, the tests were conducted to recognize the chicory roots through a vision system from scattered, unsorted storage box. A Pick-it 3d system was used to setup the testing of chicory root recognition and generating pick points. Due to high variance in roots shape, size, color, and scatteredness, Pick-it system was able to recognize and generate pick points with low accuracy and repeatability resulting in inaccurate pick points and unsuccessful pick and place.

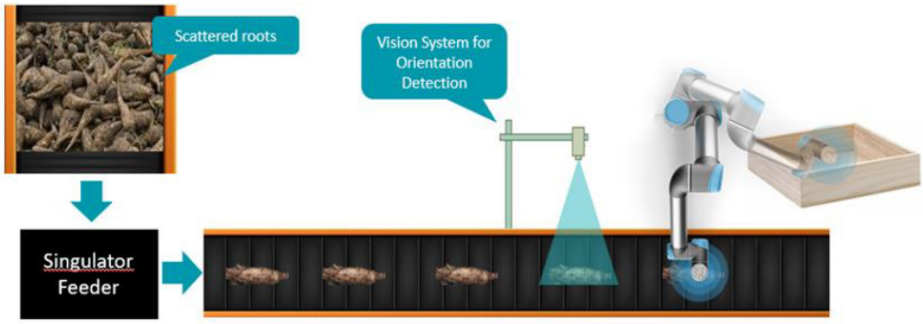


Result

The simulation of the proposed work-cell is displayed in Figure 10. The simulation was performed on the Visual Components software to analyze the cycle time for the pick and place of the chicory roots. The cycle time from the simulation results to 5 seconds. Similar pick and place setup was replicated in the real setup which resulted in the cycle time of <= 6 seconds.



The proposed design can be divided in 3 subsystems; Feeder System, Vision System and Robot System. Figure below illustrates the concept of how these systems would work incoherence and how automated work cell would work.



Interview

What was implemented and what are the benefits?

Within the COTAMACO program, a feasibility study and a potential technical solution for the EndiPro case was identified in order to automate their current manual step for the automation of chicory roots palletizing.
The study conducted in the COTEMACO program was useful research work. It provides 1st basis towards the automation solution and providing initial guides to explore in the right direction. Further exploration in the direction provided by this study would allow to reach the end goal of a fully automated solution. This will help to diminish manual labour for unergonomic and repetitive tasks supporting operators health.
A feasibility study on the proposed solution was performed; this includes the conceptual design of the work-cell, technical feasibility with validation testing, cycle time estimation, an overview of the estimated costs and a return on investment analysis.

Were your expectations fulfilled - technical implementation and support through COTEMACO?

The feasibility study performed to explore the full automation and exploring different techniques and solutions was very useful and was as expected. The study conducted gave confidence that full automation is possible and confirmed that the cycle time of a fully automated process could be close to the current operation time. Further research or technical implementations are required to mature the solution in the direction provided for fully automated solution for chicory roots palletization. The feasibility study also gave insight to the challenges which will be explored: palletizing of chicorys into grids through a vision system and further explore into automation for palletizing with grids.

How could COTEMACO support you?

Via the SME support programme, COTEMACO engages with SMEs from the automotive and food sectors through field labs. These regional field labs in the UK, the Netherlands, Belgium and Germany are showcasing key production steps in the automotive and food industries, in order to tackle current low sectorial awareness and knowledge gaps. The field labs will exchange knowledge on different manufacturing tasks, such as handling and (un)loading.
With the COTEMACO programme, manufacturing SMEs are guided through the process of adopting collaborative robotic and shop floor digitalisation technologies, from the exploration of technological opportunities to the detailed definition of a business plan.

What is COTEMACO?

The project, which is an initiative of Interreg North-West Europe, aims to support around 60 SMEs in the automotive and food manufacturing industries with so-called „test environments“ and to encourage them to integrate collaborative robotic systems and digital technologies into their business. Accordingly, in addition to increasing production flexibility, the relocation of production abroad will be curbed and the number of jobs in manufacturing increased, which will generally lead to an improvement in the competitiveness of the companies involved.
In the project new technologies are implemented in application examples - the aim is to move from the prototype in the laboratory environment to the transfer to production, taking into account the legal situation and certifications.

You want to become part of COTEMACO too?

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