Interreg North-West Europe
COTEMACO
European Regional Development Fund

Success Story

Automated Loading and Unloading a diverse collection of mirrors

Deknudt Mirrors, BEL

Automated Loading and Unloading

Company description

Deknudt Mirrors is a Belgian company with production facilities in Deerlijk and produces mirrors since 3 generations. It designs, produces and sells a diverse collection of decorative mirrors and bathroom mirrors to the worldwide retail- and contract market.

Motivation and challenges

Deknudt wished to explore the possibilities to achieve automated production that met the vision of the Deknudt manufacturing. Deknudt Mirrors is not a manufacturer of "just" mirrors. They offer artworks and wall decorations which add value to the different interior styles of their customers. The mirrors are produced with great care by their own skilled professionals using the best European glass. This means that there are many complex products and production processes.

Because of the repetitive work with sometimes quite large heavy parts that are difficult to carry, the challenge was to see whether this work can be automated or ergonomically lightened for their professionals. Therefore, Deknudt preferred using a robot or cobot that is adaptable to handle the entire range of their productline. The aim is to be able to deploy this solution in different locations within the production site, in other words: the robot must be mobile or transportable.

Another challenge was the variety of the way the mirrors are presented to the robot. They can be stacked on a cart or lying on a transport system. Placing the mirrors must also be done on a cart or belt.

And finally there was great importance attached to quality control. The mirrors are quite sensitive for damages. With special attention to the suction cups: these should not leave marks.

This feasibility study investigates the existing challenges in the current manufacturing process for double bathroom mirrors and proposes possible solutions to be included in the implementation of a flexible manufacturing cell.

Technical solution

Before loading the carts, it must be taken into account that the dimensions of the carts differ from each other. As a result, the place where the mirrors should be positioned on the carts is not clear. With the help of an intelligent camera, a pattern is searched for each cart. The position of this pattern determines the offset of the place point. The used gripper also has a small freedom of movement in XYZ direction that is monitored via a sensor.

The type of mirror and the distance to the mirror is based on determining the size of a pattern with an intelligent camera. The further the distance, the smaller the image. The shorter the distance, the larger the image.

The workplace where the robot or cobot could assist, must also be available for manual work. For this reason, a transportable robot was chosen. The proposed solution is an “Opiflex system”. This plug & play system is easy to move manually and includes the necessary safety features that guard the area around the robot. No fencing is required.

Result

The final conclusion is that the study achieved the intended result on all technical challenges.

The feasibility study shows that loading and unloading mirrors from the carts is possible. The tests have given the expected result. This means that the mirror can be correctly placed or taken from any mirror cart, no matter the size.

Also, the experiment to determine the distance to the mirror with a mirror image has given a very good result. This solution, detecting a mirror surface and determining the distance to the mirror in one measurement, is not yet available on the market.

Another conclusion was that the small movements provided in the gripper for each axis are necessary and required. This also ensures that the centering of the mirror in the pick location does not have to be so precise.
The solution of a stacked buffer for the mirrors is sufficient according to the cycle time calculation and ensures that the machine cycle is not affected.

And finally, the transportable robot ensures that the workplace can be used both as an automatic as well as a manual one.

Interview

Steven Degroote, Production manager at Deknudt:
“We faced a lot of challenges in this project, with our main focus on the following subjects:

- We wanted to place mirrors from a horizontal position on a conveyor belt, vertically correct in a groove of a rack trolley. We have about 400 of these trolleys and they are all different from each other in size.
- It was important to us that we maintained the cadence of the current machine.
- We needed to be able to switch off the robot without any loss of time and let our professionals work again in the same workplace, since not all types of mirrors can be handled by a robot.
- The integration of a robot on the current workplace was a challenge by itself: there is a bitter lack of space at our production site, not only in area, but also in height.”

Were your expectations fulfilled – technical implementation?

Degroote: “Because we have limited production space, we decided to deliver several of our mirrors and transport carts to Flanders Make. This way, nothing was changed or implemented in our workplace. The study was conducted entirely on site at Flanders Make.
We are more than satisfied with the technical preparations to correctly place the mirrors on our existing rack carts via various software techniques, invented by Flanders Make. The preceding thoughts to detect, measure and move the mirrors were sublime.
This solution was presented to us with a a short video clip, which proved that it is a technically sound solution.”

Were your expectations fulfilled - Support through COTEMACO?

Degroote: ”COTEMACO prepared everything and worked it out with a minimum of support from our side. We only presented the case. As a small SME we do not have the means to work out such a case by ourselves. Flanders Make estimated the cost of implementing such a robot and now it is up to us to decide to implement it in the (near) future.
The solution presented was in line with our desire to place mirrors from a horizontal position into a vertical position on our existing transport carts at an identical human work pace in the specific workplace.”

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.

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Then visit our website at:
www.robot-hub.org/cotemaco

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