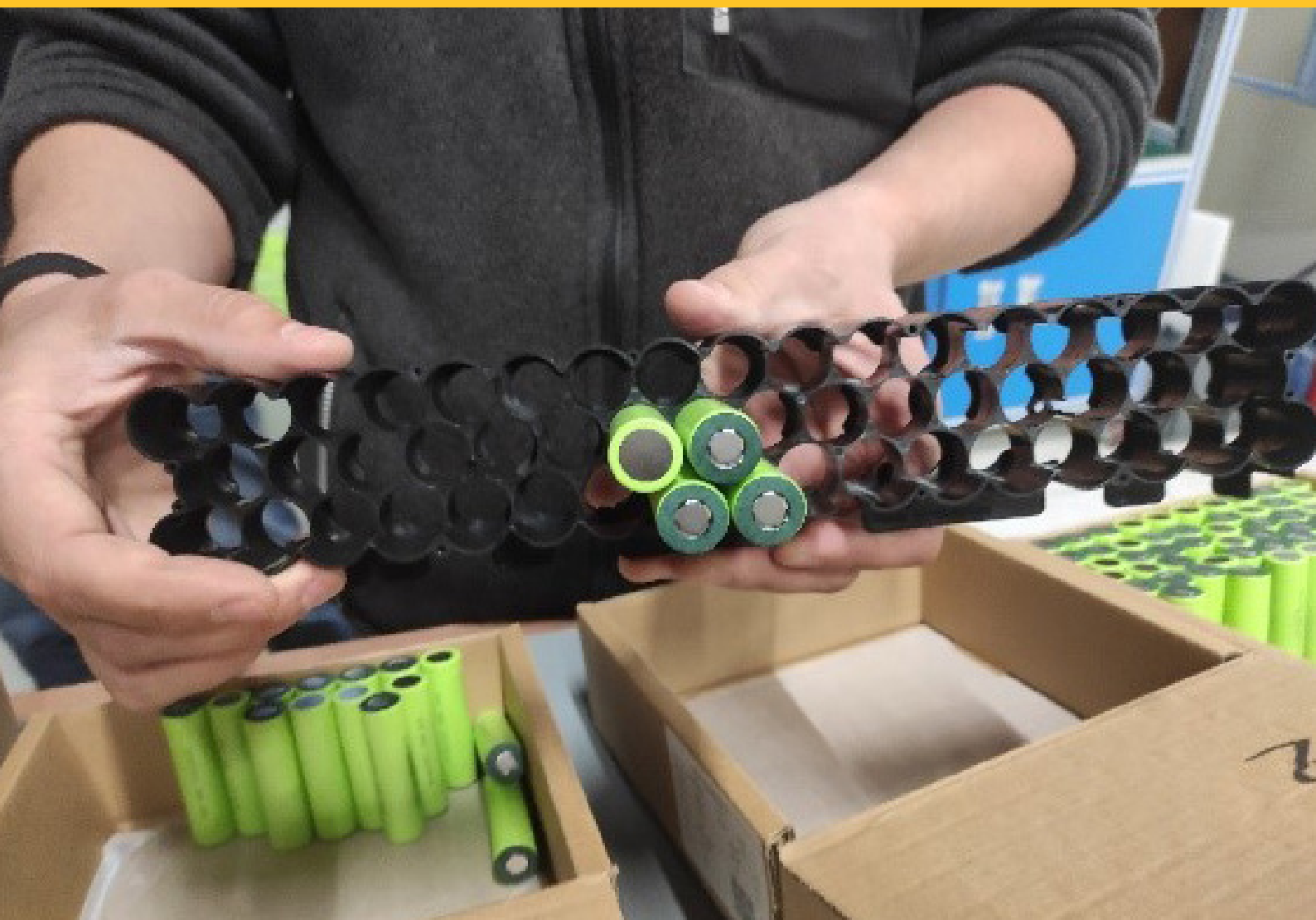
Interreg North-West Europe
COTEMACO
European Regional Development Fund

Success Story

Cobot cell design for Bikebat

Automation of battery pack assembly, BEL



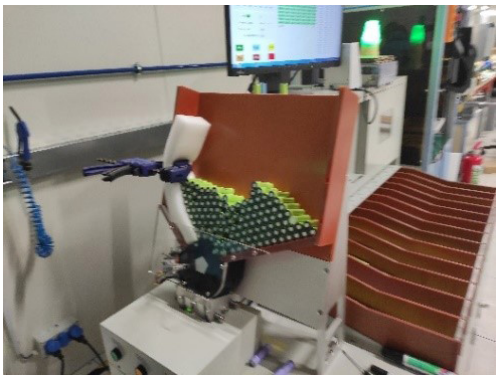
Automation of battery pack assembly

Company description

Bikebat is a Belgian company specialized in the field of **battery repair**. The production facility is situated in Bornem (Belgium) and supports customers all over Europe. The company offers services with **high quality** recovery equipment, knowledge and test equipment to recover batteries. Bikebat is capable of repairing a **wide range** of battery types varying in shape, size and composition types including NiCd accu, NiMh accu, Li-Ion, LiPo, LiFePo4 and Lead batteries. The company has expanded their services with the production of **bicycle battery** packs over the last 2 years.

Motivation and challenges

Bikebat applied to the SME support program in aim to find an automated solution for the manual operations done in the production of their battery packs. The company currently assembles battery packs at the production facility in Bornem. The batteries come in batches delivered in boxes, they are labeled, measured and sorted by the internal resistance level of the battery. The current production line delivers the sorted batteries in **sorted** buffers.

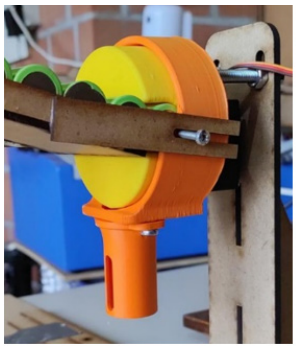


An operator retrieves the batteries from these buffers by resistance type and fills the required **honey grates** where typically around **50 cells** are manually inserted and pressed in place. The polarity is crucial and a strict pattern must be followed, specific to the battery design. The tactile feel is not difficult for a manual operation, but holds a complexity for robotic automation. This manual operations are intensive and consists of repetitive tasks that require full attention of one or two operators. Bikebat applied to the SME support program in aim to find a more **flexible** and **less labor intensive** solution by automating the honey grate fill process.

The targeted assembly capacity is **200 battery packs** per day with a daytime production of 8 hour. This results in **2.4 minutes** per **assembled battery pack**. Assuming a typical battery pack contains around 50 cells, the time constraint for an average pick & place operation for a single cell would be 2,9 seconds. Additionally, some time must be dedicated to the transfer of empty/full battery grids.

Technical solution

Flanders Make performed, in cooperation with Trebol, a feasibility study on the battery pack assembly line. The study explored the technical feasibility to integrate a collaborative robotic automation in the production process of battery packs for e-bikes at BikeBat. The primary focus is the automated assembly of 18650 lithium cells into a battery grid.



The proposed solution incorporates a cobot (UR5) with a gripper, containing 50 chamfered holes, to guide the batteries into the non-chamfered holes of the honey grate. The batteries will be realigned in the sorting buffers. The slider with rotation unit will move in front of a stack containing at least 50 cells. The cobot will bring an empty honey grate with the first hole under the rotation unit. The rotation unit rotates left or right to bring the positive or negative side down and the battery is dropped into the hole. A cylinder guides the batteries and once this cylinder is retracted, the robot can move the next empty hole under the rotation unit.

Result

The feasibility study shows that a cobot (UR5) can perform the battery assembly with a capacity of 200 battery packs per day. This is mainly accomplished by 2 adaptations in the process. The robot grasping the honey grate instead of the individual cell limits the travel distance. The chamfered inlay facilitats the peg-in-hole problem.

The sorting process is optimized with an adaptation to maintain the alignment of cells in the buffer. Due to the improved buffers, the extra step of storing cells between sorting and assembly can be avoided. The first design is currently made for 18650 batteries, but it is expandable to the larger 21700 cells. The chamfered insert can be a gripper for the honey grates and also a tool to compensate for the deformations of the honey grates, making the pick and place operations easier. The challenging gripper design due to the 1mm spacing is also avoided by the chamfered insert and the robot grasping the honey grate instead of the individual cells.

The batteries are sorted and buffered correctly in order to be picked and placed in honey grates by a cobot. The solution allows operators to divide their tasks over different machines and eliminates the current intensive and repetitive manual tasks.

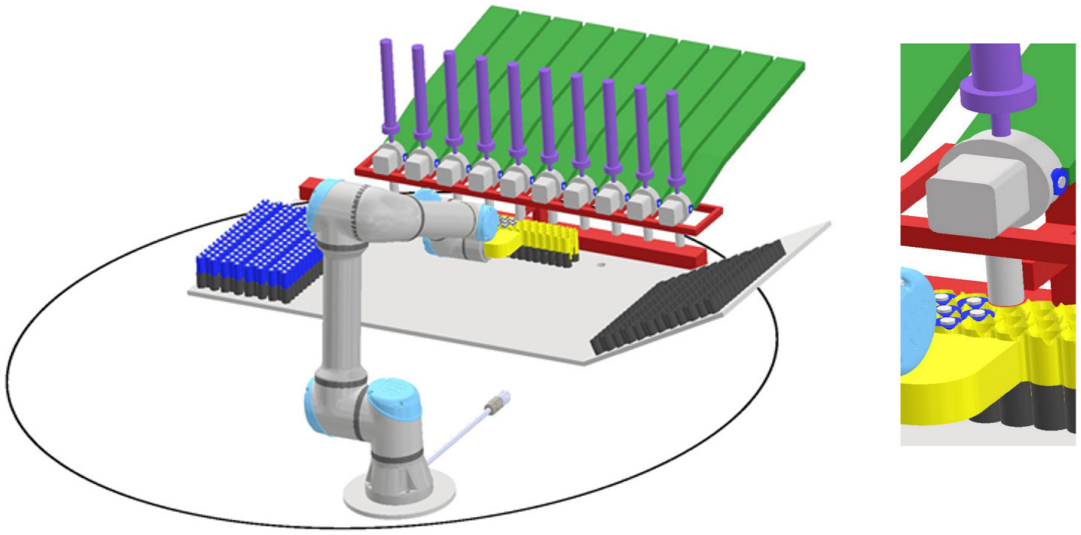
Interview

How could COTEMACO support you?

Via the SME support program, COTEMACO engages with SMEs from the automotive and food sectors through field labs. These regional field labs in the Netherlands, the UK, 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 program, 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 was implemented and what are the benefits?

Within the COTAMACO program a potential technical solution for the Bikebat case was identified in order to automate their current manual assembly of battery honey grates. The solution is able to automate the manual processes and make the process independent of intensive operator labor while being robust and efficient. A cobot has been introduced in the process automation to retain a **flexible** and **safe** working environment.
The automated solution makes it possible to **divide operator tasks** better over different processes while **eliminating** the **repetitive** and **intensive** quality control and honey grate filling tasks. A feasibility study on the proposed solution was performed including the conceptual design of the work-cell, technical feasibility with validation tests, cycle time estimation, an overview of the estimated costs and a return on investment estimate.



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

Thijs De Ridder, Production Manager, Bikebat:

"The analysis and tests are **well performed** and give a clear view on the possible automation solutions and what it costs. The results will be used in guiding future investments. Flanders Make, in cooperation with Trebol, implemented a feasibility study in a short period with **useable** and **innovative** solutions as a result."

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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www.robot-hub.org/cotemaco

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