Interreg North-West Europe
COTEMACO
European Regional Development Fund

Success Story

Automated machine tending for chamfer grinding and insertion of slot insulation in the production of electrical motor stators

ELNOR

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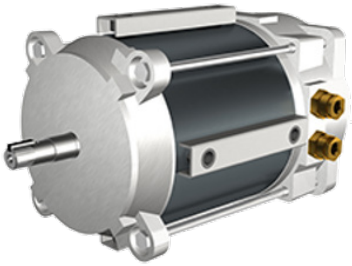
Company description



ELNOR Motors is a manufacturer of electric motors, which is active already for more than a century. Since a number of years ELNOR focuses on design and production of custom electric motors for machine manufacturers. Worldwide ELNOR motors are built in into a broad range of machines, including coffee grinders, bread-slicers, fuel pumps in gas stations, motors for air heaters, mixing machines, etc. The ELNOR motors are durable quality products offering high energy efficiency and are 100% recyclable after their long lifetime.

ELNOR also offers custom motors which are built into a broad and varied range of machines. They apply a unique collaborative approach to rapidly develop a fit-for-purpose motor – covering performance, integration and certifications – that resolves many system or machine challenges. The approach uniquely combines mechanical and electrical expertise with global explosion protection related certification, for single & three phase AC motors and DC motors.

Motivation and challenges

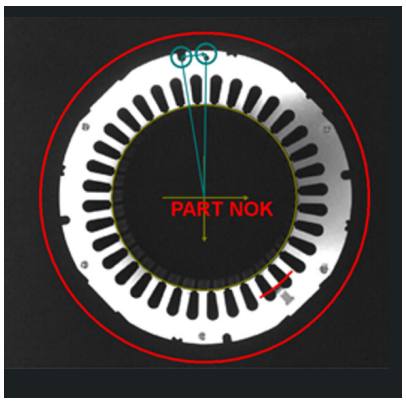
The aim of the case is the automation of a part processing sequence in the early manufacturing stage of electrical motor stators at the ELNOR manufacturing site. After the stators arrive from the supplier, they are prepared for the winding process. First, a chamfer is grinded at the stator outer edge to facilitate the insertion in the motor housing in the final product assembly stage. After grinding, a layer of slot insulation is inserted in the stator slots, to provide a shield between the stator body and the electrically conductive wiring that will be wound through the stator slots.

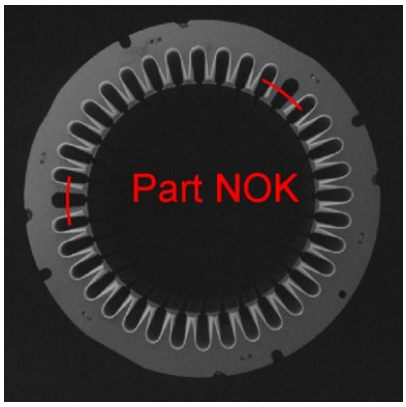
Both processing steps – the chamfer grinding and slot insulation insertion – are automated processes. However, an operator is charged with the repetitive and unergonomic task of placing the stators on the machines. Meanwhile, the operator performs visual inspection on the supplied parts. The necessity of dedicating an operator to a noncomplex task with a low skill requirement leads to suboptimal resource utilization. Due to the repetitive nature of the manually performed tasks, ELNOR would like to investigate the possibility of a robotic machine tending solution. The motivation to opt for an automated solution is strengthened by the unergonomic nature of the task.

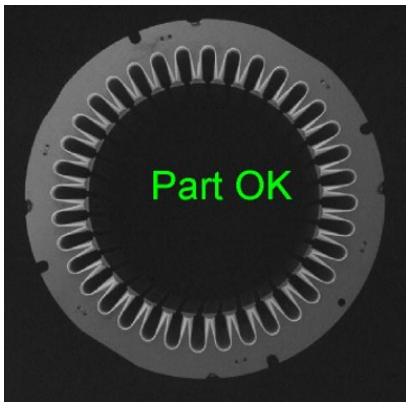
Technical implementation

Flanders Make performed a feasibility study for the case, and covered two different aspects on what feasibility means in the context of an industrial automation objective. First, the case is considered from a physical point of view, and the actual manual actions are analysed in detail. Similar actions are tested with a cobot and a two dimensional vision system to verify the actual physical feasibility. This investigation also defines the hardware requirements, which is a primer on the estimation of the investment cost.

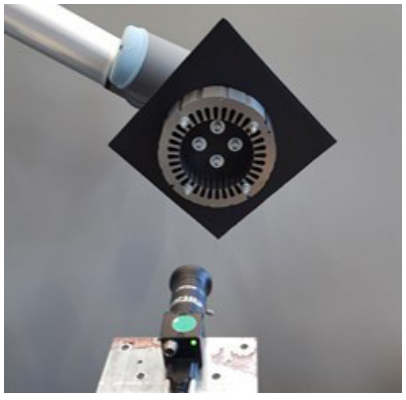
Using two dimensional computer vision, feasibility was proven for different process steps and quality control steps. Detection of the burr side of a stator, detection of part damage and quality control after insertion of slot insulation were implemented and tested.







Also, a test setup was made to prove that 2D-vision can help with the correct placement of a motor stator on the mandrel of the slot insulation insertion machine using a cobot.



Secondly, the case is considered from an investment perspective. The return on investment is determined, as well as how different factors like operator involvement and cycle time scaling have an impact on the investment return rate. Based on a cost model, feasibility is verified regarding investment.

Result

Based on the feasibility study, Flanders Make was able to help ELNOR in deciding whether automation of a given production process is profitable, or to which extent the level of automation can be persisted in order to gain a beneficial impact on both the process outcome as well as operator value.

Interview

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 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 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.

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

"COTEMACO supported us by investigating the feasibility of the implementation of a cobot application in the winding department of our company. The technical conceptual work done by Flanders Make researchers has led to valuable results. The proposed solution is promising, we now know how the different challenges can be approached, and we now are aware of the additional development that is needed before implementation. Through the support of COTEMACO, we could investigate the feasibility of the automated solution we had in mind." – *Tom Paesmans, managing director at ELNOR*

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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