Interreg North-West Europe
COTEMACO
European Regional Development Fund

Success Story

The right solution to support the operators in manufacturing and assembly of chocolate machines with digital work instructions.

Prefamac, BEL

Manufacturing and assembly of chocolate machines with digital work instructions

Company description

Prefamac is a small enterprise in Flanders which designs, manufactures and assembles chocolate machines for customers in more than 100 countries. They have an excellent reputation worldwide when it comes to quality, reliability and service. Their machines have to perform even in difficult conditions - such as exceptional humidity, high temperatures - and in exceptionally busy periods.

Their small team is continuously working on innovations to create new and flexible end products for the future.

Today, Prefamac Chocolate Machines has an excellent reputation not only as a machine manufacturer but also socially as an enterprise. No less than 17 specific targets for socially responsible international business were achieved by Prefamac as a pioneer.

Motivation/Starting Point

There is a high product variability in the Prefamac product portfolio, because most of their machines are designed or adjusted to fit the needs of their customers. More demanding customer requests, combined with the continuous search for more efficient and qualitative machines, causes these machines to grow in complexity. Combined with difficulties in finding qualified personnel and the risk of an aging workforce, Prefamac is looking for solutions to support their operators in the manufacturing and assembly of their machines.

As of today, the creation of work instructions is a time-consuming process and therefore not worth the effort for one-off machines. This results in a lack of work instructions or having only instructions of mediocre quality available for the workers. Therefore, many machines are assembled by experienced employees, who have the right insights in the process and can make adjustments when necessary. This leads to having to rework the instructions and potentially wasting time. Also, the current work instructions are printed on paper and uses enlarged images of the assembly part. The instructions are delivered to each of their operators, with risks of loss, problems with traceability and not to mention the negative impact on the environment.

Therefore, Prefamac is interested in an easy to use toolchain for the (semi-)automatic creation of digital work instructions for the assembly of their machines. Important in this regard is that it uses Computer-Aided Design (CAD) information.

Analysis

The feasibility study focused on the (semi-)automatic generation of digital work instructions (DWI) for the assembly of chocolate machines. For this, a toolchain is required that consists of the following components: a CAD importer, a CAD to DWI converter and finally a DWI exporter. Since Prefamac is using the Solidworks 3D software program for their CAD design, the importer should be able to handle the file formats that can be exported directly from Solidworks, in this case the STEP format. For the CAD to DWI converter, a semi-automatic tool is desired, such that operators and designers can add their own insights to the work instructions. Finally, for the export functionality, a DWI platform is chosen that allows to bring the instructions to the production floor by means of tablets. Criteria such as traceability and operator feedback are important here. The goal is to reduce the time spent on the creation of instructions, improve their quality and reduce the time waste during the assembly process by using DWI.

Work instructions for service operations, such as maintenance, repair and operation manuals, are out of scope for this feasibility study.

Technical Realization

The proposed toolchain consists of two software tools: the first one being CAD2DWI, a second one being a DWI converter. Flanders Make recommends the use of the CAD2DWI tool. The tool was built using the Unity platform. It is designed to extract instruction data from imported CAD files, and convert this data to existing work instructions in DWI platforms. This can be an automated process, which is a big advantage. As Prefamac is using Solidworks for their 3D CAD designs, a specific plugin is required to import these file formats into the CAD2DWI tool. The original plugin was too expensive and had a negative impact on the ROI. Therefore, other plugins and import functionalities were investigated to reduce the cost of the toolchain. Eventually we ended up with a generic importer for STEP files, resulting in a lower cost.

After the import, the CAD2DWI tool creates step-by-step information until the CAD model is fully disassembled. The process of disassembly is then reversed in order to receive the assembly information. Based on this information, all textual and visual information (images and animations) is generated based on the geometries in the imported CAD file.

Finally, this information is put through a DWI converter which uploads the received information of CAD2DWI to the desired DWI platform according to a desired template structure. In our case, Proceedix was chosen as commercial DWI platform, due to its multi-device support, traceability and operator feedback possibilities.

The process can be done manually, semi-automatically or automatically. The last 2 options are applicable to the Prefamac case, since this saves the most amount of time and therefor results in the largest benefits.

Result

CAD2DWI and the DWI converter for the case of Prefamac, resulted in the following benefits:

- Reduced time-cost for the creation of DWI
- Better traceability
- Customizable instructions from input of the operator
- Positive environmental impact

A statement described by Kristof Godelaine, innovation engineer of Prefamac:

“The main benefit of CAD2DWI is the incredible output its generates. The user basically just has to disassemble the machine similar to an exploded view in CAD software. CAD2DWI automatically generates step by step instructions for the worker with video and images. The program saves a lot of time by automatically generating assembly step by instructions. Which normally would require a lot of manual time.”

View from the employee perspective

Compared to working with paper work instructions, digital instructions can be easily adjusted when needed without printing new versions. They have the advantage that they’re always up-to-date and can’t be lost.

Operators which are using the instructions, can add missing information by using annotations or adding photos. This decreases the margin of error for less experienced operators, as well as improves the quality of the work instructions.

From an engineering point of view, the ease of use is another factor which is beneficial when using digital work instructions. In general, the provided toolchain, making use of CAD2DWI, is easier and faster. Additionally, feedback to existing instructions added by the operators allows for continuous improvement.

From a customer point of view, the traceability in the assembly process was improved and both the speedup of the instruction creation and the reduction of time waste might lead to shorter lead times.

Interview

Kristof Godelaine, Project Development Manager at Prefamac explains what he was aiming for when participating in this program.

“We needed help in the digitalization of our workplace and had some specific questions. For example, how can we integrate tablets in our digital work instructions process, which software is most suitable and how can we prevent them from getting damaged? Also, we needed a firm business case to convince our management of the feasibility for our company. And on a more practicle side: how can we acquire CAD2DWI when the program is finalised?”

What was implemented and what are the benefits?

I tested two programs CAD2DWI and Proceedix.
Godelaine: “The main benefit of CAD2DWI is the incredible output its generates. The user basically just has to disassemble the machine similar to an exploded view in CAD software. CAD2DWI automatically generates step by step instructions for the worker with video and images.

In my CAD program I could achieve the same results, but it would require me to make an individual exploded view for each step. And to put each step on a separate 2D drawing and print it out.

Proceedix was used to visualise the instructions to the users. The CAD2DWI data was already uploaded to it, so we did not use it ourselves to create or edit the instructions.

So the main benefits for me are:

CAD2DWI

- Speed: the program saves a lot of time by automatically generating assembly step by instructions. Which normally would require a lot of manual time.
- Comprehensible: The program makes both drawings and video animations. On a 2D drawing it is not always clear how something fits together.

Proceedix

- Feedback: The worker can immediately provide feedback by taking a photo, note or video. Currently the user has to write down their feedback on the 2D Drawing and this requires more discipline.
- Comprehensible: The app shows the instructions step by step with the provided output of CAD2DWI. On a 2D drawing it is not always clear how something fits together."

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

"Godeleine: No not yet, CAD2DWI has a lot of potential and the output of the program is incredible. At the moment when I did my testing, there were still technical issues that prevents me to switch from my workflow in SolidWorks to CAD2DWI.
Probably if the development team gets more resources, these issues can be fixed to improve the user experience.
On the CAD2DWI part, the support of the Flanders Make team was great. Quick in their response and they provided me with tips and workarounds for the issues I was experiencing. Very helpful.
In the future, we would like to get a chance to participate in user testing on tablets, that would be very helpful for us."

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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