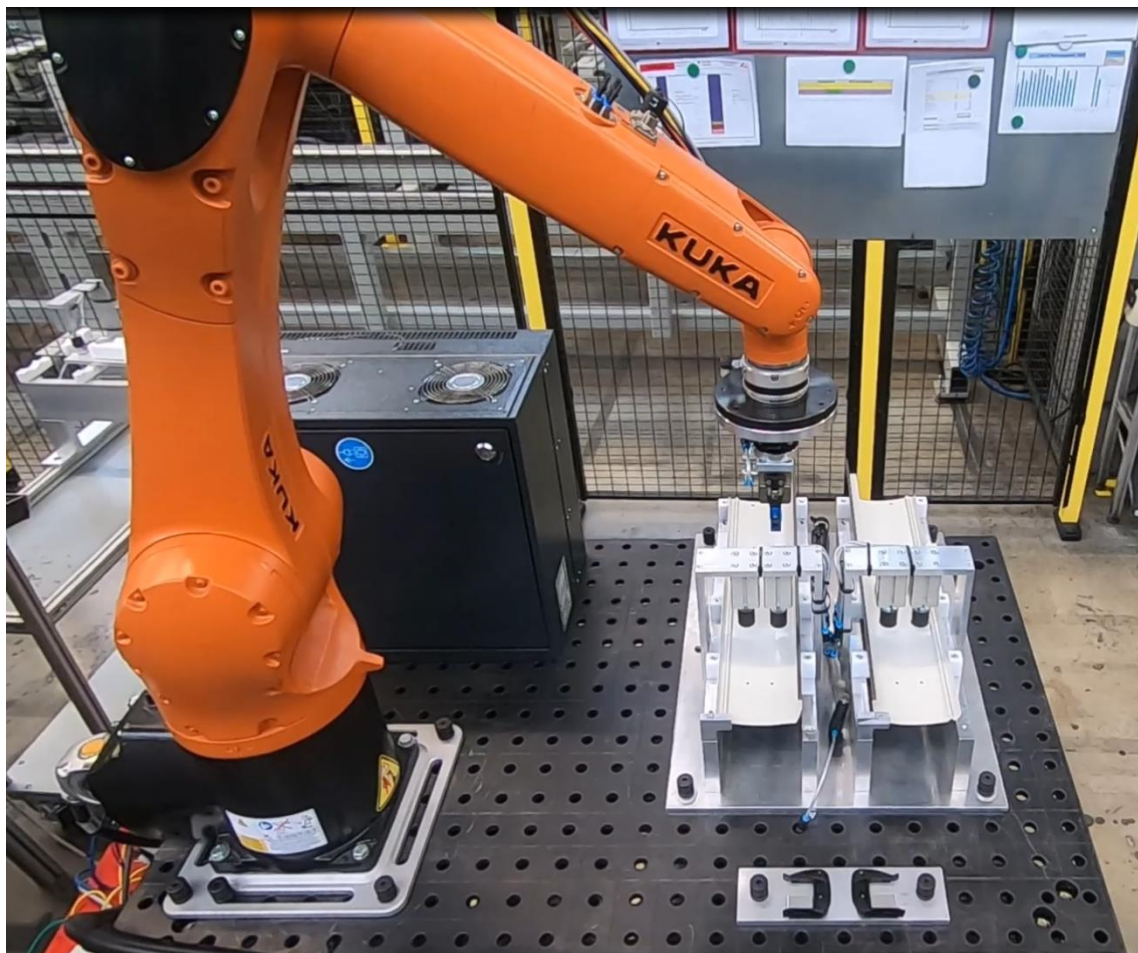


Modular Robot Cell for Multiple Preassembly Processes in the Production of Roof Windows and Roller Shutters

Automation in production is often very costly. Therefore, the automated processes have to yield a high return on investment. Processes which are low on return relative to capital invested will not be automated.

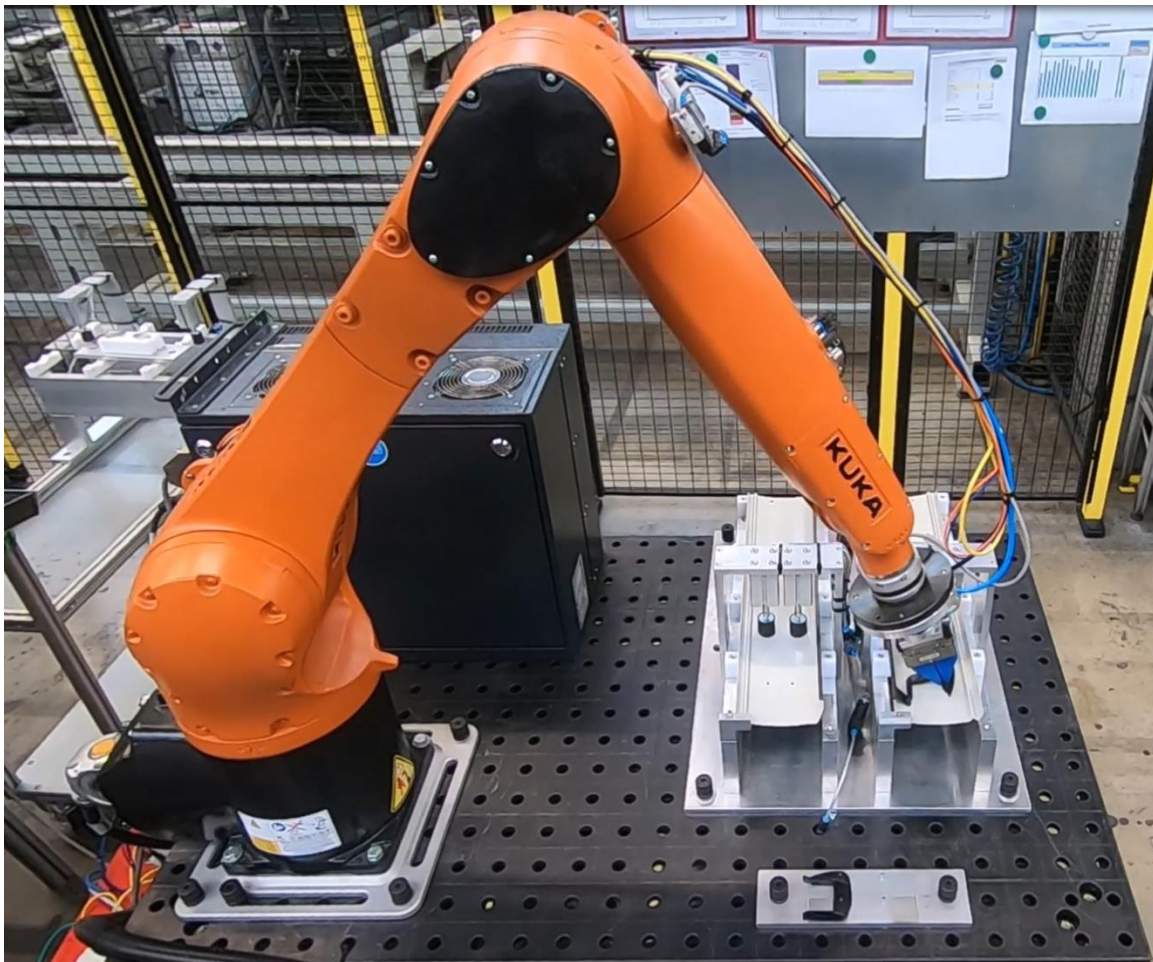
By participating in the Project RampUP, we were able to gain knowledge on how to solve this issue. The application of a modular robot cell allows us to automate multiple different processes and therefore making the investment reasonable and economically viable.



Picture 1: Use Case 1

The Project RampUP helped us to develop an understanding of what intelligent modules are for robotic automation. With the gained understanding and the built up know-how we are sure to automate further assembly steps in the future.

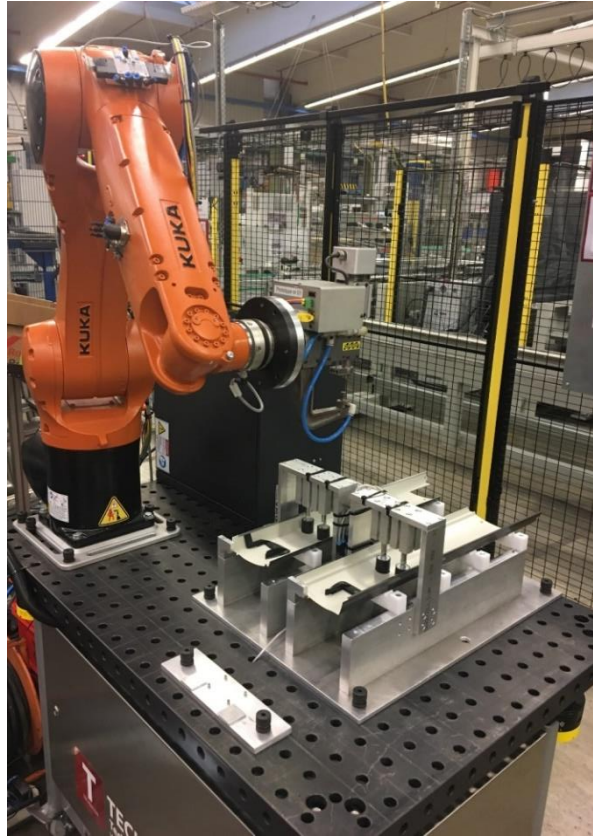
In our opinion, the modular design is particularly suitable for smaller assembly steps and component pre-assembly. The modules can be exchanged quickly and easily, which makes it possible to switch quickly between different applications. A milestone in the modular design developed in RampUP is the platform based on a standardized table with a fixed hole grid for the assembly of all required components. In the course of the project, Technicon further developed this platform into a fully equipped Flex-Cell by using standardized hardware equipped with all necessary connections, control components and safety devices. This Flex-Cell is ideally suited as the basis for a simple assembly.



Picture 2: Use Case 1

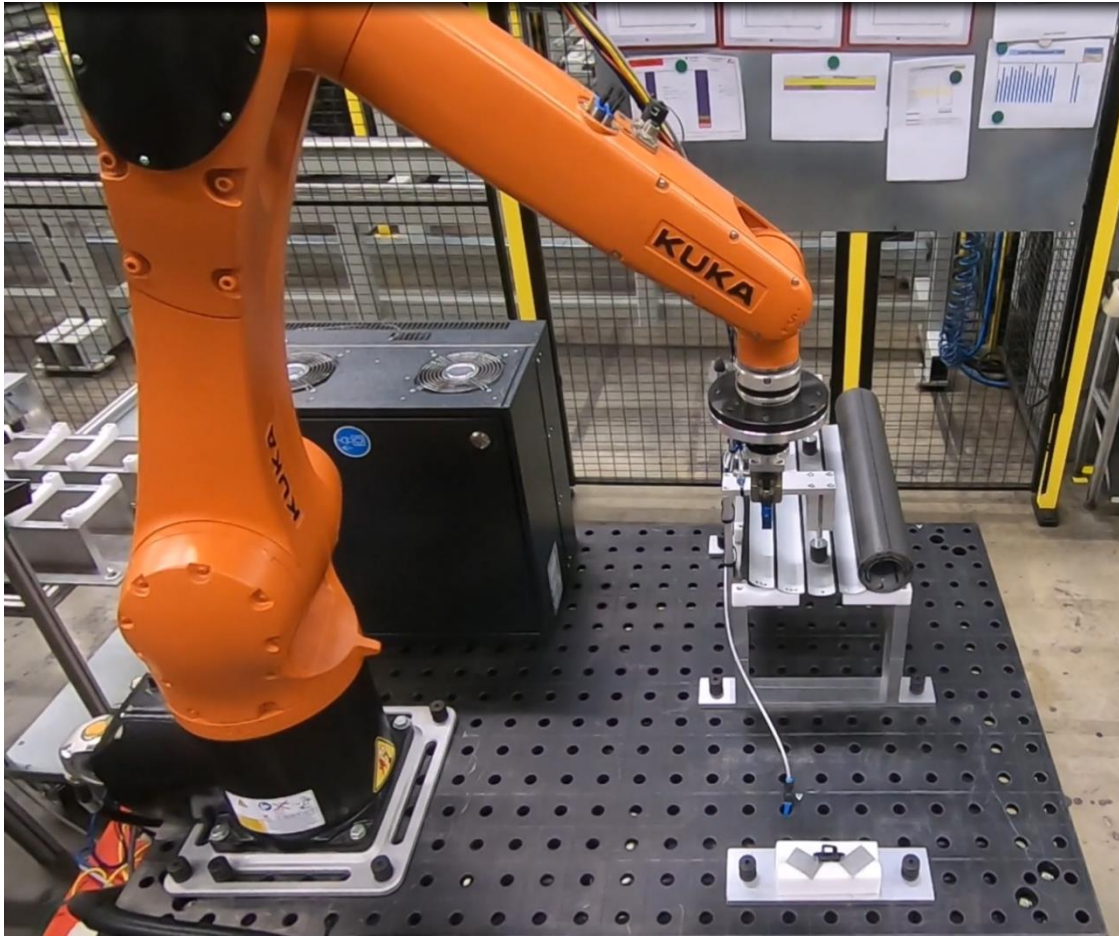
The modular design makes it possible to ensure a meaningful utilization of the robot. Thanks to the Flex-Cell, the robot is not bound to a specific location and can be quickly deployed anywhere in the production process. Once an application has been implemented, a high

utilization of the robot can be realized by a quick change between different applications, even with applications running only hourly.



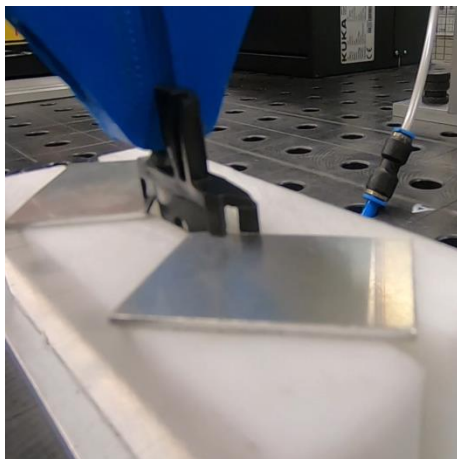
Picture 3: Use Case 1

The principle of modular design enables us to automate assembly steps independently in the future by purchasing standard modules such as grippers, riveting presses, adhesive dosing systems, etc. and by building our own workpiece holders. This is rounded off by the robot software Drag&Bot, which has been further developed to market maturity in the RampUP project. In the course of the project we found out that even a technical employee without profound knowledge in robot programming is able to program the robot with Drag&Bot.

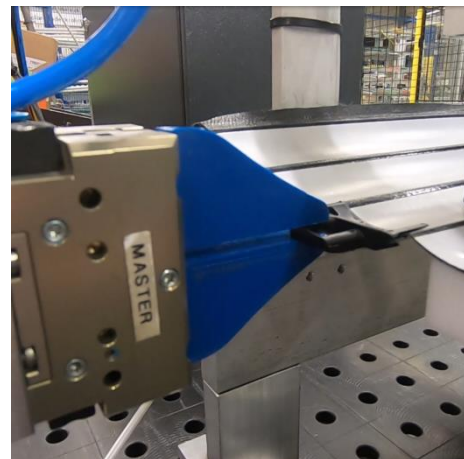


Picture 4: Use Case 2

We see great market value for system integrators in modular design. After development, standardized modules can be deployed on a variety of new applications and thus, can be sold in different markets. In my opinion, this creates a completely new market that allows



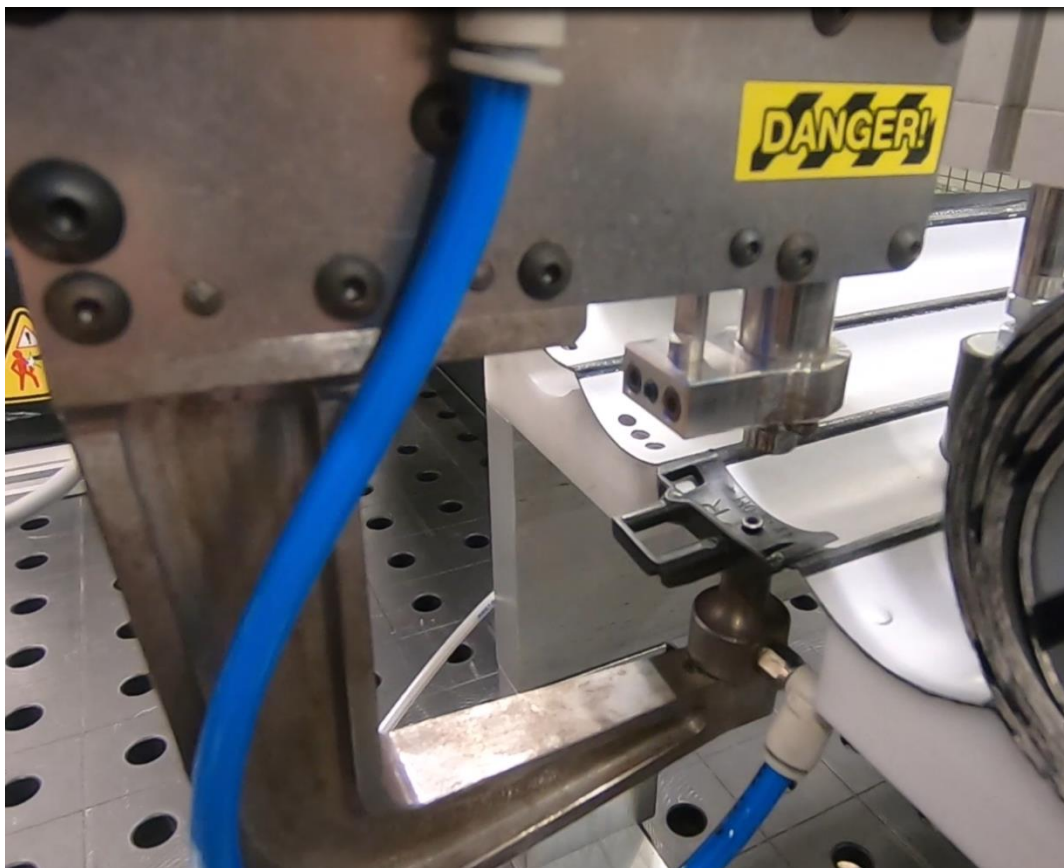
Pictures 6: Use Case 2



Picture 5: Use Case 2

automation according to the modular principle. Thereby, the user has a portfolio of standardized modules at their disposal, which can be continuously expanded by system integrators.

There is a lot of potential in connecting the modules to the Drag&Bot software. We still lack a standard for the integration of the modules. In the course of the project, we learned that the connection is still relatively difficult to establish. For the system integrators too, there does not seem to be agreement, since the project has shown that each system integrator has developed its own way of integration. This clearly indicates that a standard for connecting the modules is absolutely necessary in order to offer them to the market.



Pictures 7: Use Case 2

The company Happtec Smarter Robotics is making progress to implement a solution for the standardized connection of modules. This would complete RampUP's idea and thus help automation by means of modular construction to final market maturity for the industry.

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