Integrated project Engineering Technology

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Automation of gear assembly in a transmission

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3th Bachelor of Electromechanical Engineering Technology

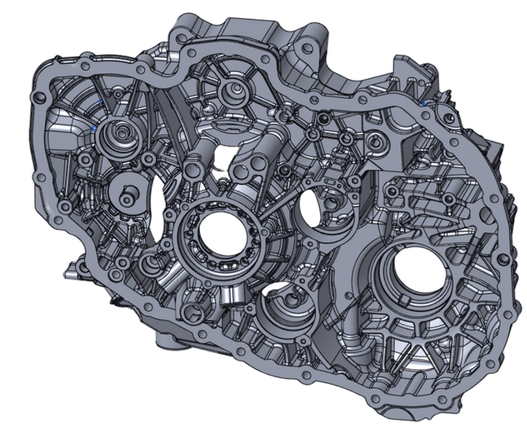

Figure 1: Housing without gears and shafts

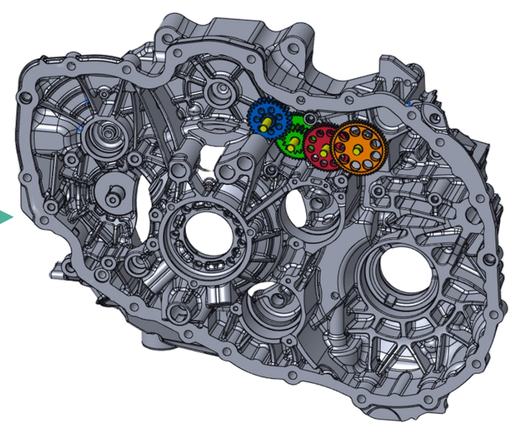

Figure 2: Housing with gears and shafts

Situation

Stellantis e-Transmissions is a core industrial partner within the Stellantis Group, specialized in the large-scale production of advanced electrified dual-clutch transmissions (eDCT). As the automotive sector undergoes a rapid transition toward electrification, the company focuses on high-volume, high-precision manufacturing to support a global fleet of hybrid and electric vehicles.

Currently the assembly of **four shafts** and **four gears** into a housing is handled manually. To improve the production efficiency and reduce the cycle time, Stellantis wanted a dedicated machine that could automate this assembly step.

The shafts and gears are key components in the automated gear-shifting mechanism.

Input & Storage

The shafts and gears are delivered to the machine in standardized **industrial crates**, which serve as the supply units for the assembly process. These crates are positioned at the rear of the machine to ensure they are continuously accessible for replenishment.

To manage these crates efficiently, a **roller conveyor system** was integrated as the central storage and transport solution. This system functions as a buffer, ensuring a steady movement of components toward the robot and increasing the machine's operational autonomy by maintaining a constant supply of parts.

Figure 3: Industrial crates

Figure 4: Roller conveyor system

Handling of the parts

To automate the assembly of components into the housing, a **Fanuc LR-10iA/10** industrial robot was selected. This choice aligns with the existing technical standards and operational consistency within Stellantis facilities.

To execute the complex handling sequences required, a custom **End-of-Arm Tool** (EOAT) was engineered with a versatile vacuum-based pickup system. This tool is designed to pick gears directly via suction while simultaneously manipulating the shafts from a horizontal pickup to a 90° vertical orientation. By integrating these functions into a single unit, the robot can pre-assemble the shaft and gear mid-air, allowing for **simultaneous insertion** into the housing. This streamlined approach significantly reduces cycle times and ensures high precision throughout the assembly process.

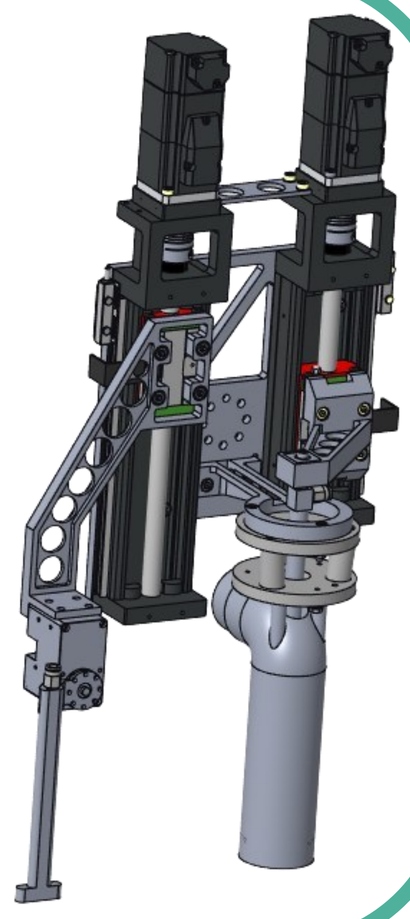

Figure 5: End-of-Arm Tool

Result

When everything is **combined** and is in accordance to the machine requirements, the machine of Figure 6 is the result. In this machine the housing enters the station from the right side and leaves the machine on the left side with the shafts and gears. At the back is storage for full and empty crates which hold the shafts and gears.

Figure 6 shows a big gray block, this proposes the conveyor at the production line of Stellantis.

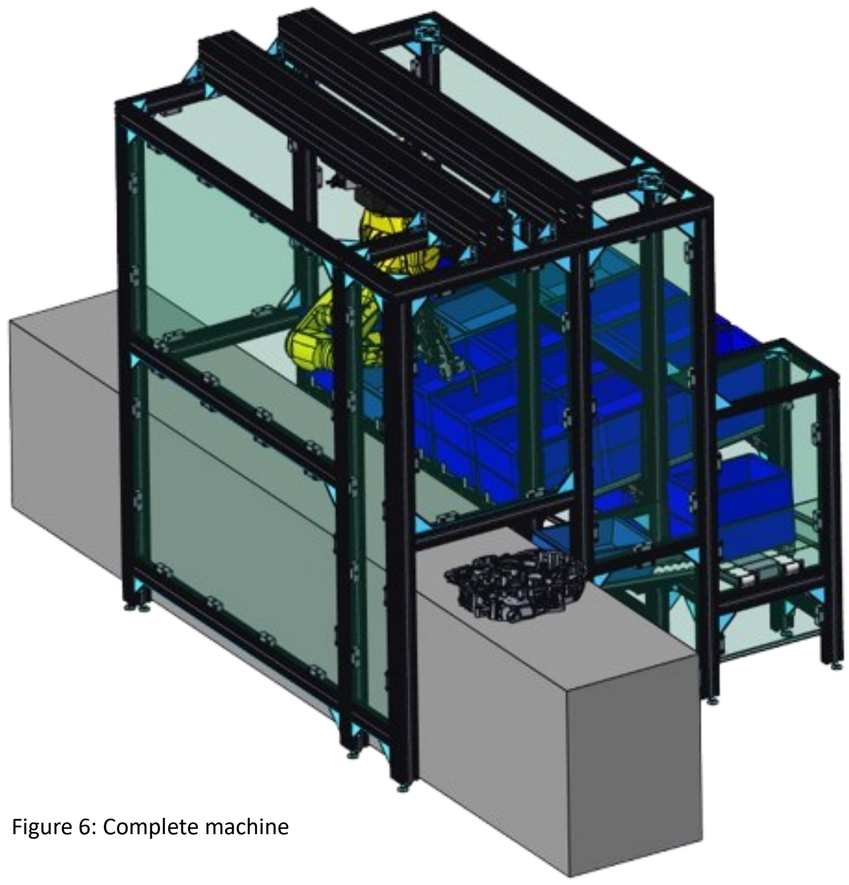

Figure 6: Complete machine

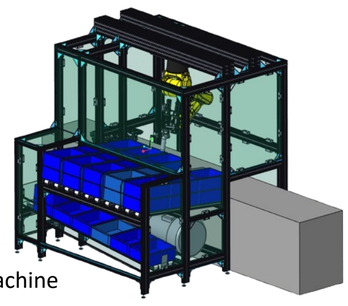

Figure 7: Complete machine

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STELLANTIS e-Transmissions

De opleiding industrieel ingenieur is een gezamenlijke opleiding van UHasselt en KU Leuven

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