

Smarter programming with cobots: how ROBUST is focusing on programming ease for flexible automation | Cobots manual - part 8

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Smarter programming with cobots

In the metalworking industry, many SMEs come up against an intractable paradox: they need automation, but their production context lots of variation, small series often makes classic robotic solutions unfeasible. The COOCK+ ROBUST project investigates how reconfigurable, mobile cobot cells can still become economically viable in this high-mix, low-volume (HMLV) landscape. One of the keys? Programming ease.

The faster and more intuitively a cobot can be reprogrammed for a new task, the shorter the downtime, and the faster the return on investment. In this blog, we explain which programming methods are relevant for SMEs from teach pendants to AI-driven robot instructions and how they contribute to the flexibility and autonomy of cobots in a manufacturing environment with a high number of changeovers.

Discover how Sirris and KU Leuven designed a robust, reconfigurable cobot cart for sheet metal applications. Download the COOCK+ ROBUST casebook for a practical, step-by-step guide to build your own cobot.

Download the ROBUST casebook

From teach pendant to autonomous planning: what is programming ease?

Each cobot needs instructions on where to move, how fast, and under what conditions. This information must be delivered efficiently and correctly. The classic method is to use a teach pendant, where the operator enters points step by step and defines the logic. For simple, repetitive tasks, this works fine, but in an HMLV context, it quickly becomes time-consuming and error-prone.

That is why ROBUST looked into alternatives such as:

- **Offline programming (OLP):** programming on a PC without stopping the production line
- **Teach by Demonstration (TbD):** guiding the robot through the movement by hand
- **Parametric programming:** using one program for an entire product family by injecting variable data
- **AI-driven planning:** robots that autonomously plan their task via sensors and abstract goals



Teach by Demonstration: intuitive step towards flexibility

For SMEs without specialised programming knowledge, Teach by Demonstration is an accessible and powerful solution. In this process, the operator manually guides the robotic arm through the desired movement and the positions are saved automatically.

A more advanced version is Path Recording, where an entire movement, such as sanding a surface is recorded as a series of points. This approach is ideal for finishing tasks and significantly reduces programming time, even for complex trajectories.

Offline programming: less downtime, more control

With Offline Programming (OLP), the robot program is prepared on an external PC. As a result, the robot does not have to remain idle during the programming process. This is an important advantage when working with small batches and frequent changeovers.

There are various levels:

- **A simple version** where a logic is prepared and points are added online afterwards
- **A full 3D simulation**, where the entire programme including movement points is built and tested offline
- **Specific OLP tools** for force- and sensor-based tasks (e.g. deburring with force control)

The disadvantage is that this requires expertise and software costs, but for frequent product changes and complex paths, it can improve the ROI.

Flexibility through parametric programming

Another powerful concept is parametric programming. Here, the robot program is built with variables that are adjusted for each product variant via Excel, HMI or sensor data. The robot adjusts its path automatically, without the need to rewrite the entire program.

This is particularly relevant for SMEs working with slightly varying product families and seeking a high degree of reusability in their programs.



AI-driven robotic planning: the future becomes reality

The most forward-looking method is AI-driven programming. Here, the operator formulates an abstract goal (‘place this workpiece on that pallet’) and leaves it to the robot to plan and execute the task itself via sensor data and logic.

Thanks to techniques such as TAMP (Task and Motion Planning) and the integration of sensors (vision, force, position), the robot can autonomously adapt to small deviations and unforeseen situations. This technology is still in its infancy, but increasingly accessible solutions are coming onto the market, including for SMEs.

Conclusion: programming ease as leverage for robot flexibility

For SMEs looking to deploy cobots in a flexible manufacturing context, programming ease is crucial. Not every method suits every situation. The optimal approach depends on:

- The **complexity** of the task
- The **frequency** of product changes
- The **expertise** available in the company

What is certain is that choosing the right method allows you to drastically reduce setup time, improve the ROI and exploit the full potential of cobots.

ROBUST | Reconfigurable cOBotic prodUction AsSistanT

ROBUST helps sheet metal suppliers with high-mix-low-volume production to automate repetitive tasks using mobile, reconfigurable cobots. Because small batches and changing orders often stand in the way of standard automation, the project uses demonstrators to show how cobots can be flexibly deployed for a variety of tasks such as pressing, welding, deburring, and gluing. ROBUST offers companies practical tools and knowledge to work step by step toward more efficient, (semi-)automated production.

Discover the ROBUST project

Discover the other parts of the Cobot cart manual

Part 1: building a cobot cart: sturdy, smart and ready for the workplace
Part 2: how do you ensure perfect alignment of your cobot cart?
Part 3: how does a cobot cart communicate with its environment?
Part 4: smart cobots thanks to 3D computer vision
Part 5: from workbench to mobile cobot assistant: make your production flexible
Part 6: making a mobile cobot plug and play using real-time pose tracking
Part 7: safety when using movable cobot cells: how ROBUST helps companies comply with the regulations

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