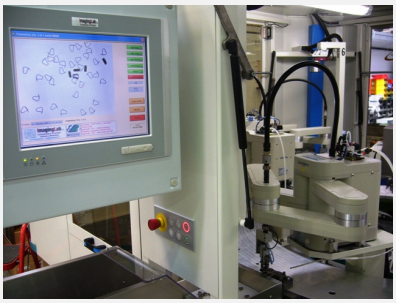
Designing an Integrated Vision and Robotics Cell for Terminal Block Assembly with NI Vision Hardware and Software



A great advantage of using the LabVIEW platform is the possibility to design and customize the graphical user interface.

"With the NI standard, we can implement fast integration of any product in the projects, shortening development time and costs."
- Cristiano Buttinoni, Certified LabVIEW Developer (CLD), ImagingLab

The Challenge:
Designing a system that tightly integrates robotics and vision for assembling electric components with short batches and a variety of products.

The Solution:
Installing five Mitsubishi SCARA robots guided by NI vision systems using the ImagingLab LabVIEW Robotics Library for Mitsubishi, several NI IEEE 1394 frame grabbers with reconfigurable I/O (RIO), software developed with NI LabVIEW, and the NI Vision Development Module.

Author(s):
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Automatismi Brazzale, an established producer of assembly and packaging lines, asked ImagingLab to assemble the complete range of terminal blocks (40 different models) in a cell with only one configuration, which can be divided into six steps. We installed five Mitsubishi SCARA RP-5AH robots around a rotating table, each positioned to perform a specific task that can change from model to model.

The project specifications were challenging: 2,500 pieces per hour with a range of 40 different models, requiring a total of 32 different parts to handle and mount. We installed six vision systems, one for each robot station plus one to inspect the housing block for quality. Every robot station had to handle different parts depending on the model in production. The main point of the project is to allow the line operator to easily manage short batches and a variety of models.

Configuration of the Vision and Feeder Systems

We identified machine vision as a pivotal part of the project. The vision systems allow the robotics cell to recognize and pick different parts in random positions and mount them in the proper slot with very high accuracy to avoid specific setup for the different terminal block models, which reduced the stopping time from batch to batch and made the parts stocking unique for every model. This eliminated the need for special containers for different components.

In addition, choosing the feeding system for the robot stations was critical to keep the setup flexible. The components can arrive in random positions on the feeder; therefore, the feeder should be able to move forward to shake the parts and make them available for the robot to pick them up based on the vision system indications.

At each station, the system uses a FlexFactory Anyfeed SX-240, which is programmable and can be managed by LabVIEW software based on information from the vision system. The Anyfeed systems are integrated in LabVIEW with the ImagingLab LabVIEW Robotics Library.

When the parts arrive at the feeder, the vision system acquires an image and locates the part available for picking. The location information is sent to the robot that picks the part and accurately puts it in place within 0.02 mm.

The vision systems guide the robots and the feeders and provide the quality control on the individual subcomponents by measuring the dimensions and verifying the integrity before they are added to the terminal assemblies. The robots reject the defected parts.

Implementing NI Products for Tight Integration and Flexibility

Using the ImagingLab LabVIEW Robotics Library for Mitsubishi, we implemented tight vision and robotics integration. As a result, the user can calibrate imaging and robotics with only one operation. Our decision to adopt the LabVIEW platform was strategic because the software allows us to program, prototype, and test new applications in a short time. Another great advantage of using the LabVIEW platform is the possibility to design and customize the graphical user interface.

Additionally, using NI products and the LabVIEW platform offers great flexibility in choosing hardware for our systems. We can reuse part of the hardware and equipment from project to project. Furthermore, with the NI standard, we can implement fast integration of any product in the projects, shortening development time and costs.

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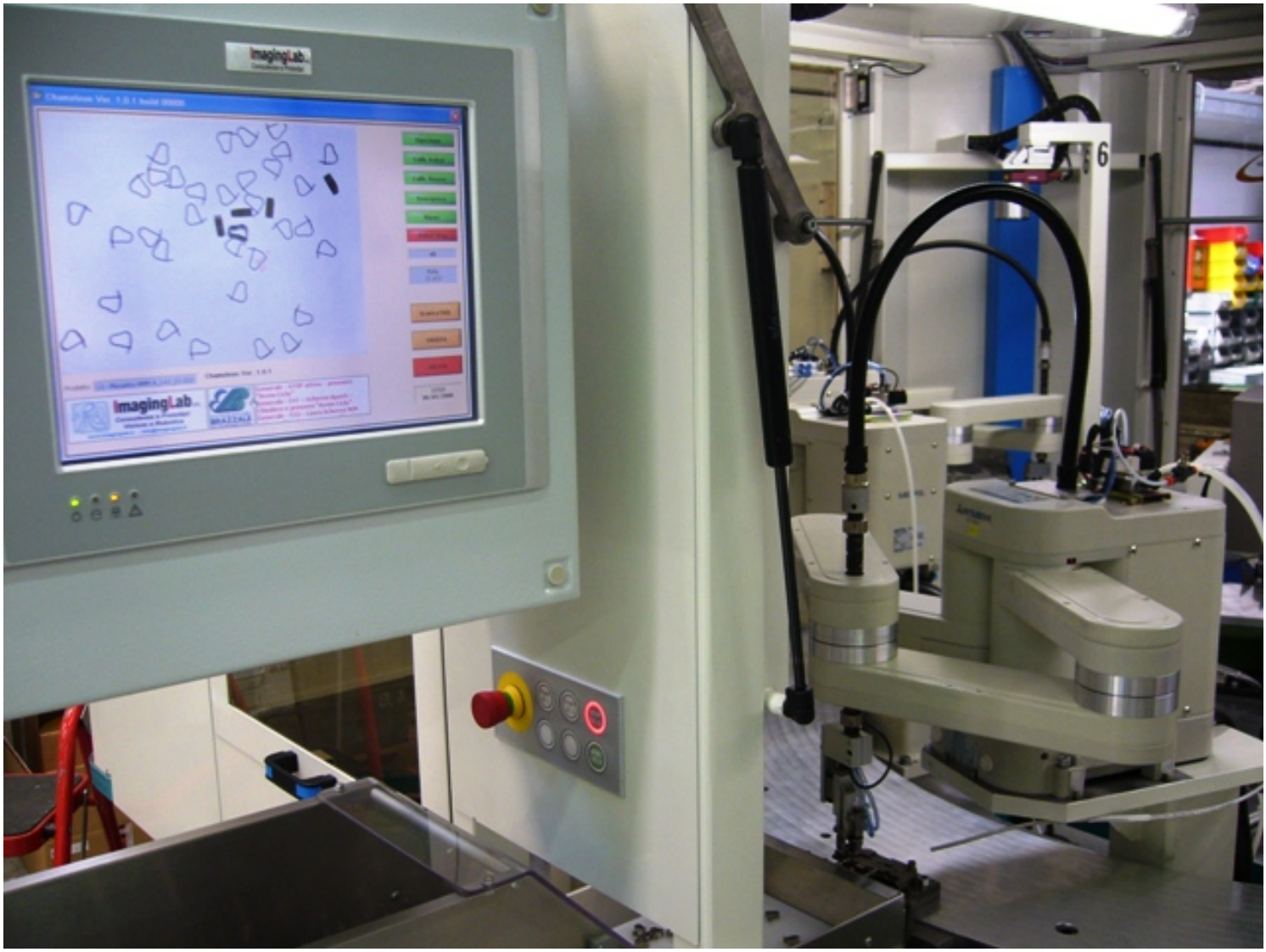

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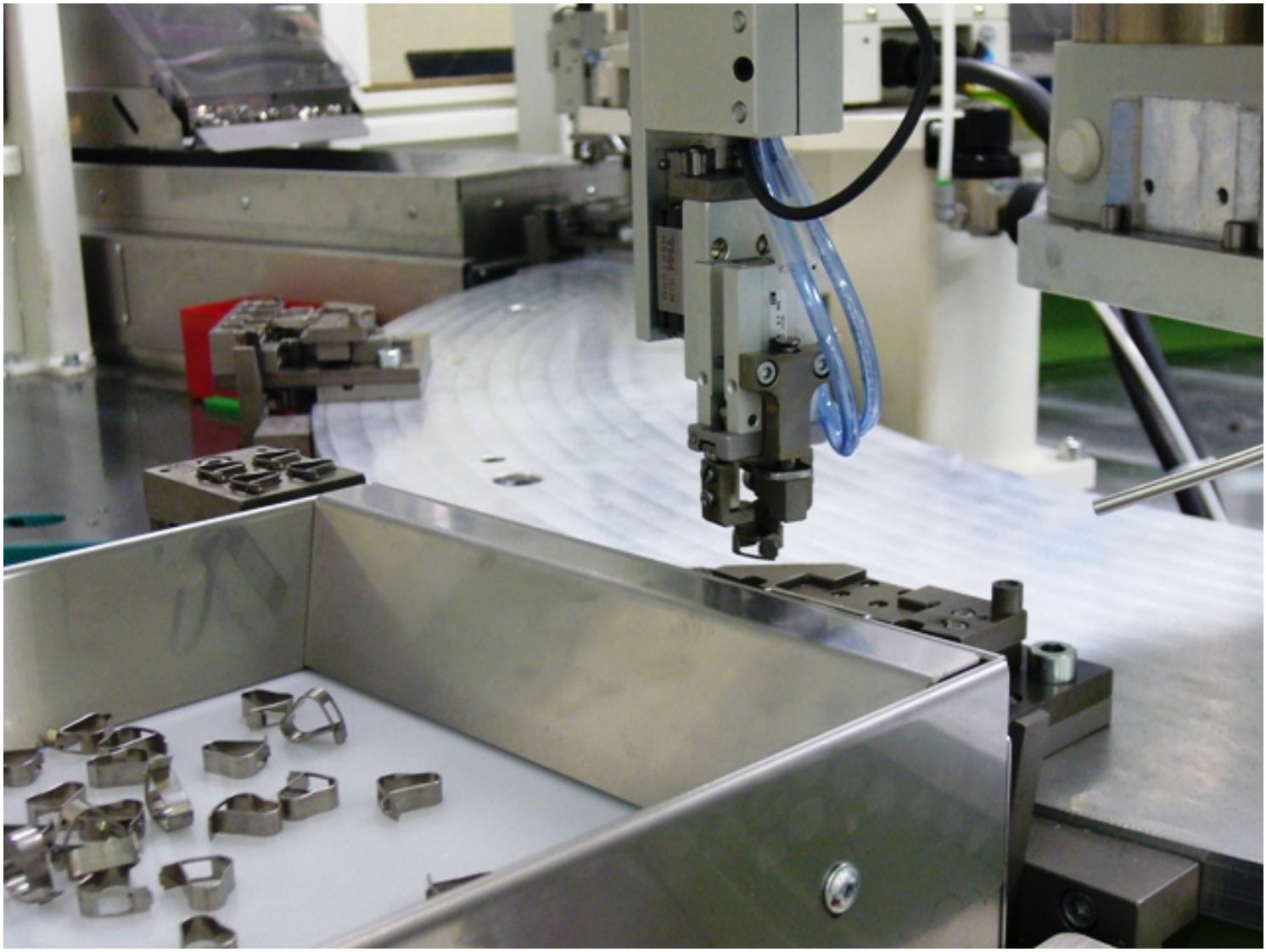

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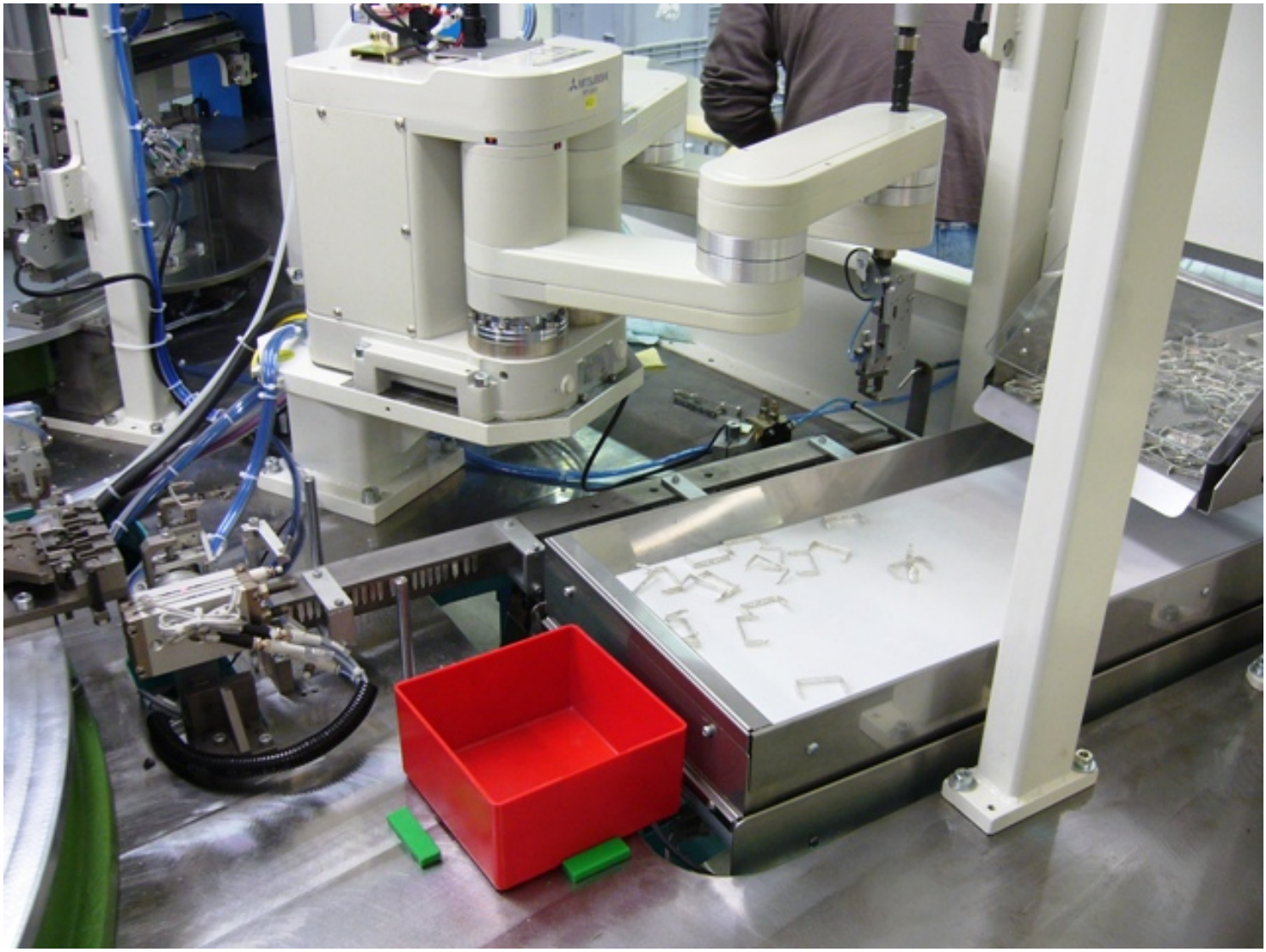

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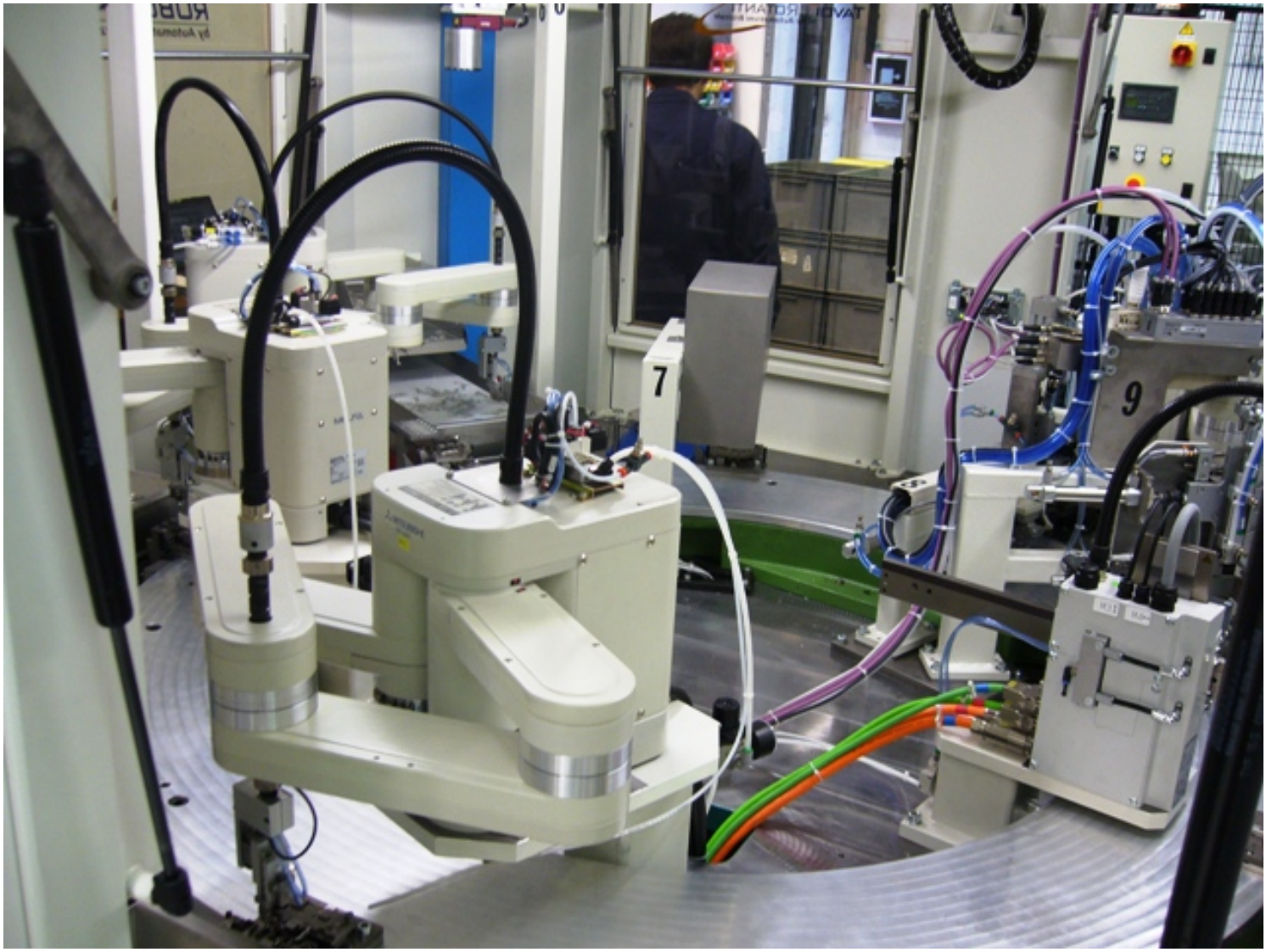

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