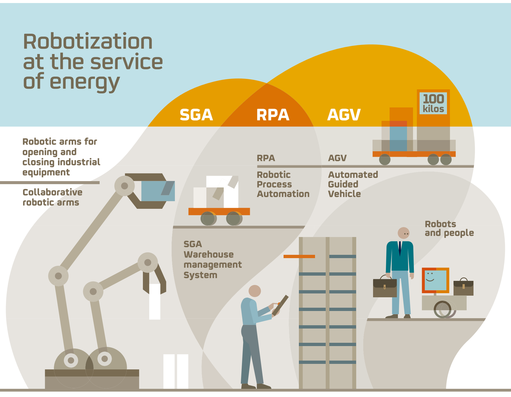

Robotization is one of the main vectors in Repsol's digital transformation strategy to improve safety and efficiency in all its processes. In 2020, the energy company will carry out its first pilot test using a logistics robot to transport materials in an industrial complex. But that's not all: it has already automated over 100 processes thanks to RPA technology and is incorporating components in robots already in use to make them more intelligent.

Training is essential so that people have the necessary tools to respond to the challenges that robotization presents. With adequate training, more professional opportunities will emerge, an essential aspect to overcoming the crisis caused by COVID-19. In order to reverse the current situation, increased investment in research is a fundamental component, whose greatest supporter in Spain is industry, where 80% of private R&D&I is born.

Repsol has been clearly commitment in this regard for a long time. In the case of robotization, the Company is training its employees to lead this process, seeking to increase the synergies of human-machine interaction, so that people can focus on tasks with higher added value, such as decision-making.

Repsol has two robotics hubs —one for software and the other for hardware— aimed at developing and implementing physical and software robots to complete routine tasks and free up employees or carry out potentially dangerous work in industrial facilities.

The automated guided vehicle (AGV) can transport a load of 100 kilos, opens doors or elevators remotely, and charges its own batteries

The Repsol Technology Lab in Móstoles (Madrid, Spain) develops disruptive technologies that are later implemented in the Company. At this center, which is home to the robotics hardware hub, four lines of robots are being developed: logistics robots, warehouse automation systems, collaborative robotic arms, and robotic arms to open and close industrial equipment.

The financial impact of introducing robots is estimated at over 3 million euros in 2021 just at the Tech Lab, and this figure will significantly increase when robotization spreads to all of the firm's areas.

Robotizing transport and warehouses

Repsol's first automated guided vehicle (AGV) already transports samples and equipment between the warehouse and the various laboratories located in the buildings of the Tech Lab.

For Alfonso García, leader of the Experimentation 5.0 project from Repsol's Division of Technology and Corporate Venturing, the AGV "improves efficiency in many ways, for example by making deliveries at times that do not interfere with work in the laboratories, scheduled or on-demand deliveries. In addition, it does not depend on people's availability and can carry much more than a person, thereby optimizing the delivery route." However, the biggest advantage "is that it frees up our technical experts from this low-value task so they can concentrate on more important work, such as decision-making."

Named RobLab by employees of the Tech Lab, the AGV is a collaborative robot equipped with a 3D depth camera, ultrasound sensors, and safety bumpers that detect people and objects so it can avoid them or stop.

Thanks to its SLAM (simultaneous localization and mapping) navigation system and a set of sensors (laser scanner, gyroscopes, and inertial navigation systems) RobLab moves around independently, communicates with elevators, and opens doors remotely. Capable of transporting up to 100 kilos and with a battery that lasts for up to 10 hours or 20 kilometers, it charges its batteries without human intervention to ensure it is always available.

Furthermore, in July of this year Tech Lab's warehouse automation system will become operative. This system will deal with the 60,000 samples received from the industrial complexes each year. The robotized warehouse "combines software to automate the Warehouse Management System (WMS) and hardware with an AGV to transport loads within the warehouse," continues Alfonso García. The robotized system "will be integrated with another AGV that already makes deliveries so they can communicate and ensure the samples get to the end user."

Robotic arms to improve safety

Thanks to two collaborative robotic arms that remove and replace containers, shake samples, or clean tools to prevent cross-contamination, the Tech Lab's lubricant base pilot plant operates completely autonomously 24 hours per day. This investment has led to a fivefold increase in the capacity of the plant which makes formulations for Repsol's Lubricants area, thus improving its response at a time when this area is in the midst of an internationalization process.

Also in the pipeline was the installation of a robotic arm with five axes and the ability to lift up to 30 kilos, which open and close the reactors in the refining pilot plant. With the arm, "we aim to improve safety and try out this technology to see how else we could use it in our operations on an industrial scale," continues Alfonso García.

Over 100 processes have been automated using software robots (RPA)

At this same plant, a system made up of two robotic arms will be operating next July, which will prepare the plant's daily samples and be in charge of carrying out chemical analysis, thereby reinforcing the safety of the technicians and reducing the costs associated with these routine operations.

Of all the robotic platforms being tested, the most mature ones that are ready to be used on an industrial scale are logistical and warehouse automation robots. In 2020, the first pilot test using a robot in a refinery will be carried out. In this location, "any form of transport could be robotized so that people can spend their time adding value in more important areas," explains Adolfo Andrés, Manager of the Robotics Hardware Hub. "The large-scale use of robotic arms that act directly in our processes requires more secure and complex hardware systems than in other industries, but eventually we will see them, too."

Automation of recurrent tasks

Repsol is also working to automate processes by using RPA (robotic process automation) technology. With this technology, software robots perform tasks that, until now, were carried out manually or were semi-automated, allowing employees to spend their time on more analytical tasks. As part of a cross-company strategy reaching all areas that is led by the RPA Hub, more than 100 process have been robotized in different areas.

The Company offers training to its employees on the new professional profiles created by robotization

At the Repsol Technology Lab, six processes have already been robotized. One of these is the daily report to monitor the pilot plants, which operate 24 hours per day, and this task is now carried out by a software robot overnight. "Apart from being efficient, the use of the robot prevents errors in a task that involves handling a large amount of information and, above all, takes a monotonous task, such as checking data, off our technicians' hands," explains Alfonso García.

Processes that have been automated with RPA must fulfill certain conditions: they must be repetitive and based on rules, have structured data, and require a large amount of time and resources. Repsol is getting its employees involved in this implementation through workshops that use collaborative methodologies such as design thinking, so that they can identify which processes should be automated.

Robots as a complement

The progressive robotization of certain jobs will mean that employers and workers must make an effort to learn about and adapt to a new scenario that will create opportunities for new professional profiles. "As part of our Experimentation 5.0 project, we are supplementing this process with several courses that teach participants to program robots, for example;" continues Alfonso García. The aim is to give our employees the tools and resources they need to lead the way toward a future where robots will play a key role in many of our work processes."

If robots and humans are to coexist, this will require a cultural transformation, a challenge that Repsol is addressing by providing information to all areas of the Company involved. "Robots are a complement that increases safety and does away with routine tasks. People, on the other hand, are able to perform highly complex work such as decision-making, something that robots cannot do," concludes Adolfo Andrés.

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