

### INNOVATIVE MACHINING TECHNIQUES

## INCREASING AUTOMATION THROUGH ROBOTIZATION

These days, the aerospace industry seems relatively less concerned with innovating in its machining processes, preferring to focus on increasing productivity and decreasing turnaround time. Nevertheless, some OEMs, parts suppliers and machine tool manufacturers, aided by industry support funds, continue to invest in R&D in three major areas: optimizing the use of machines, improving tools and further automating processes, in particular through robotization.

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### TOWARDS ROBOTIZATION

Today, robotization is clearly the most innovative and promising source of progress, with almost all players agreeing that this will generate a wide range of benefits. The key is to transfer a certain number of machining operations to a robot equipped with the necessary resources. For the simplest, most repetitive and tiring manual tasks, with little added value, the main benefits include reduced production time (with the possibility of programming operations 24/7) and lower labor costs.

“Beyond these basic applications, robotics offer many other advantages,” says Laurent Combaz, President of Le Créneau Industriel. “For example, required floor space is vastly reduced – almost half that of a 5-axis machine with equivalent capacity – and it is serially-produced piece of equipment, which means price reductions of up to 30% compared to traditional CNC machines for the same tasks. On top of that, this versatile and flexible piece of equipment is faster and easier to deploy and can be used for high-volume serial production. Quite frankly, we can wonder why there aren’t a lot more robots in the machining world at this point!”

In fact, there are two reasons to explain the lack of uptake. First, the accuracy of a “standard” robot is still generally below the machining requirements of the aerospace industry. Second, the operating and



*At the production facility of Le Créneau Industriel, a robot is used for ultrasonic cutting of honeycomb core parts.*

programming methods for robots are very different from those used in the “machining world”. Focusing on overcoming these difficulties, Le Créneau Industriel was recently granted a three-year €1.16m French Inter-Ministry Fund (FUI) budget, supported by the Mont-Blanc Industries “Acrobot” Competitiveness Cluster.

### THE “ACROBOT” ACTION PLAN

The action plan to achieve the required levels of accuracy is based on two series of complementary improvements. The first approach is to increase the accuracy of the robot in absolute terms, mainly through digital correction solutions carried out in three stages: statically, dynamically and correcting deviations caused directly by the effort of machining itself. The second approach focuses on reducing the mechanical strain on the robot. This is achieved by introducing low-effort machining processes that produce

fewer deviations. Other improvements include reducing the movement of the robot through better design and developing specific tools and tooling systems that cater to this constraint.

A first application (in the form of an industrial demonstrator) can be seen at Le Créneau Industriel in Annecy-le-Vieux. Parts are made using a combination of traditional milling and ultrasonic cutting techniques, which are ideal for making honeycomb parts. A second application is being developed for high-precision drilling of satellite panels, using an orbital “effector”, which is a type of milling head that integrates movements to allow very accurate drilling without the robot moving during the entire process.

The next stage in the ‘Acrobot’ project is to achieve absolute accuracy with the robot, thus enabling it to machine composite parts. Specific patent pending tooling, being developed with Precise France, will make it possible to machine hard metals in the future. Today, the robot is driven by a Siemens CNC, using standard programming and control settings, featuring traditional machining functions and a user-friendly control interface. “Basically, we have stayed in the familiar territory of the machining world”, concludes Laurent Combaz.

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