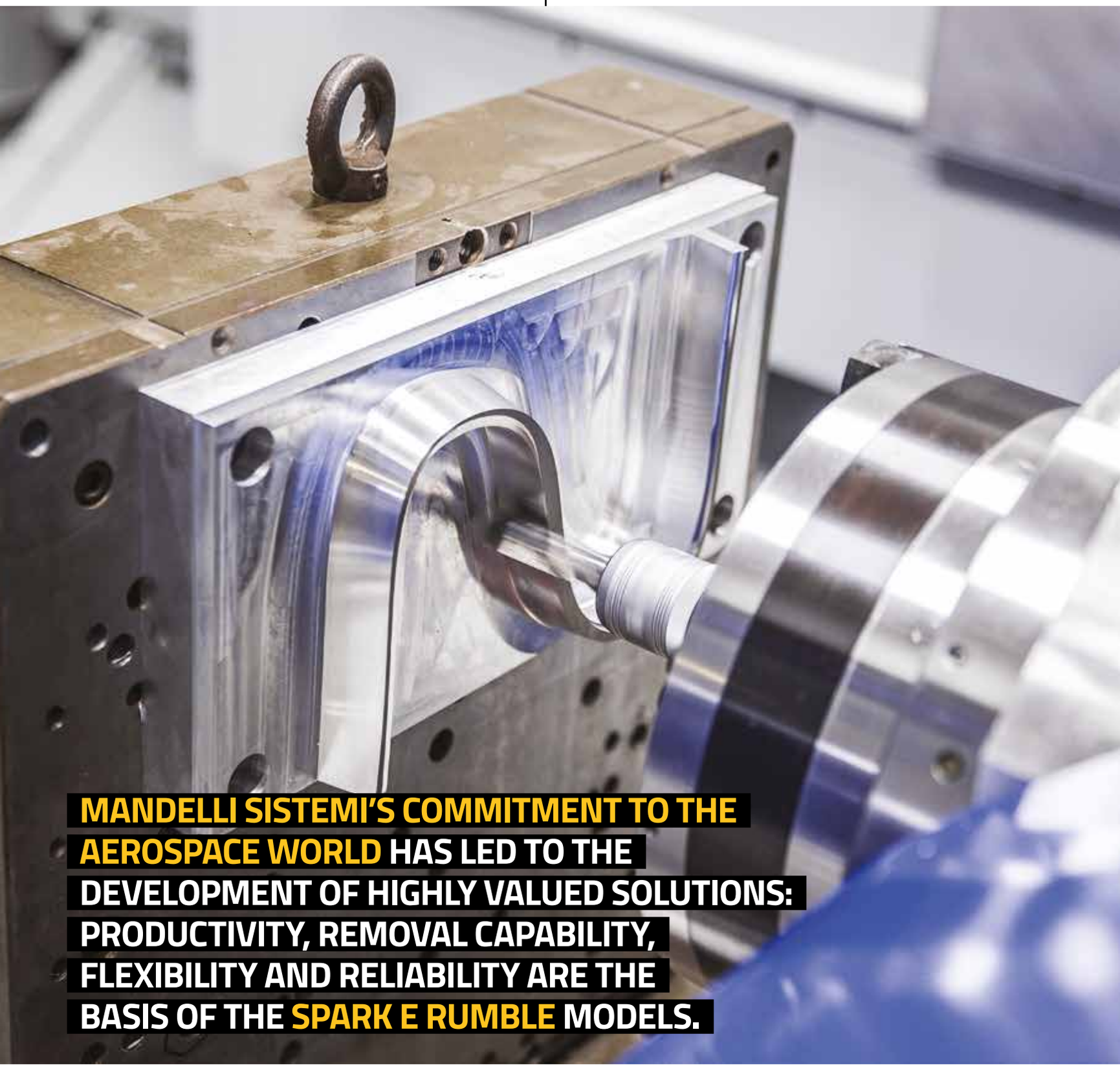
The aerospace S-Shape Test has now become a standard procedure for the testing of 5-axis HMCs



MANDELLI SISTEMI'S COMMITMENT TO THE AEROSPACE WORLD HAS LED TO THE DEVELOPMENT OF HIGHLY VALUED SOLUTIONS: PRODUCTIVITY, REMOVAL CAPABILITY, FLEXIBILITY AND RELIABILITY ARE THE BASIS OF THE SPARK E RUMBLE MODELS.

[MACHINING CENTERS]

by Andrea Pagani and Ernesto Imperio

Protagonists in **aerospace**

Technological innovation has always characterized Mandelli solutions. Since its foundation more than 80 years ago, the company has focused on the ideal features to meet even the most demanding sectors: power, speed, flexibility, precision and reliability have always been the pillars that have distinguished the company's HMCs allowing it to establish itself in important application areas. Aerospace has recently become a set of major revolutions: hard materials, high precision machining, high-productivity require high-performance milling and turning.

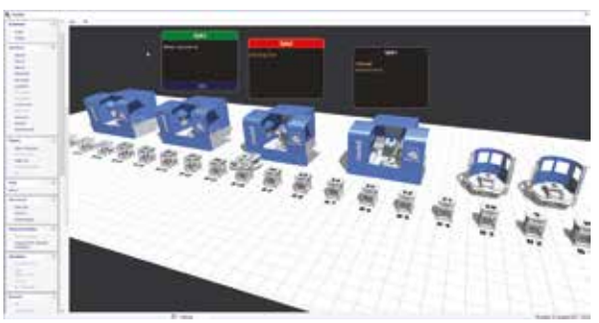
«For about 5 years now,» says Marco Colombi, Mandelli's sales manager, «aerospace is for us the leading market to which we are turning our attention: in the field of mechanics, it is the only sector to have a positive outlook in the medium term. We are talking about orders for the next 20 years! Mandelli has invested heavily in R&D to meet these specific needs and the results are rewarding this strategy: the prototype of a new machine we have presented at the recent edition of EMO in Hannover is yet another proof of the success of our ideas».

Mandelli's philosophy has always been aimed at machine tools of high quality, precision, robustness and great removal capacity.

As a result, when the company decided to focus more on this sector, it found a fertile ground to concentrate its commitment on as for the Spark 5-axis horizontal machining centers.

Born to work more efficiently with more traditional materials such as steels, cast iron and light alloys, Spark has been made highly performing even with titanium and super-alloys machining.

Left : the FMS systems are getting increasingly widespread among customers with high value machining



Right : iScada is Mandelli's innovative supervisor with 3D graphics for FMS systems

Market needs and solutions

Mandelli's aerospace market is diversified because the company addresses its products to all types of customers, not just airplane manufacturers which often assemble subgroups provided by their suppliers, but also Tier 1 customers where there are prestigious companies that build and assemble important

Left : Mandelli produces customized solutions for the machining of special components

Above : Rumble, the 5-axis profiler for the machining of large size titanium components

ORIGINALLY BORN TO MACHINE STEEL, CAST IRON AND LIGHT ALLOYS, SPARK HAS BEEN TURNED INTO A HIGHLY PERFORMING HMC FOR THE MACHINING

OF TITANIUM AND HRSA

subassemblies such as engines, and Tier 2 where there are less important subassembly manufacturers and assemblers, and Tier 3 that is subcontractors who are entrusted with the execution of high-value mechanical machining.

«In this scenario - explains Colombi - proposing standard catalog solutions is quite difficult because every customer has different production needs. In general, however, our customers' demand aims at meeting important needs such as machining precision, strict geometric and dimensional tolerances, the ability to approach materials difficult to be machined and high stock removal rates».

In the present case, top level accuracy is dictated by the design criteria of highly advanced aerospace components that ensure greater safety to the aircraft. In addition, in recent years, the use of very tenacious, resistant and light alloy materials such as titanium alloys and HRSA-Heat Resistant Super Alloys has increased.

The need for machines capable of high stock removal rates comes from the fact that the allowances with which the rough pieces are made are oversized because it is necessary to be sure that there are no defects inside the workpiece.

We are talking about dozens of millimeters without counting the work-pieces machined from the "full", that is a raw metal block.

«Today the challenge for manufacturers is to develop productive solutions that, besides guaranteeing high torque values, high chip removal and structural rigidity, can also offer greater production efficiency and greater automation with the obvious purpose of increasing the competitiveness of the machine tool user ».

With the new high performance 5-axis solutions by Mandelli these objectives are met. For example, the new Spark HMCs for titanium machining include 5 extremely robust axes that are able to perform roughing and finishing operations to finish the piece in a single setup. Today there is also a further evolution, not yet so widespread in the aerospace sector, which is related to the automation of plants, as it has already happened with automotive and general mechanics.

«This gradual but decisive opening towards automation - continues Colombi - is now possible thanks to the reliability of current HMCs, the ability to undertake in-process controls with measuring probes and other solutions that provide safe working even on unattended shifts. An indispensable requirement for those who work very expensive work-pieces, having great value and great complexity; pieces that, in the case of titanium, can be large and require processing times of several days».

Talking about automation to Mandelli means proceeding with FMS lines, even with robotic loading / unloading, on which the company has a long-lasting experience gained in other application areas: in this regard, Mandelli has a considerable competitive advantage to other machine tool manufacturers.

There is also another trend in the aerospace industry that aims at adopting more and more flexible machines, capable of performing diversified machining operations.

The most striking example is that of landing gears traditionally machined in many phases and on many machines - even very different – that cause a congestion within the organization of

material flow in the factory. More flexible machines would minimize these criticalities perhaps losing some efficiency on the single operation but simplifying the workflow and making the business system more responsive to the variation in terms of orders.

Below left : high torque spindle heads guarantee top quality 5-axis roughing while simplifying the production process

The 4.0 Remote Control Software ensures a remarkable HMC uptime

rpm.

Mandelli's proposal for aerospace is completed with the Rumble solution, the new generation of 4-axis horizontal profilers: these are gantry type machines designed to guarantee maximum stock removal performance on structural components up to 6 meters in length - mostly used in the aerospace sector - with predominantly longitudinal prismatic shape and made of titanium alloy.

It is worth pointing out that all Mandelli's HMCs are Industry 4.0-oriented also thanks to the new iPum@Suite 4.0 continuity of production and the utmost reliability of the machines and production system as a whole. Therefore, preventive maintenance tools and, even more, predictive maintenance ones are decisive for maximum machine availability. Precisely in this regard, our Service Department is highly structured and geographically well-distributed to ensure very short intervention times thanks to our specialized centers in Europe, North America and China, which are the three main reference markets». ■

TO MANDELLI AUTOMATION MEANS FMS SYSTEMS EQUIPPED WITH LOAD/UNLOAD ROBOTS, A WORLD WHERE MANDELLI CAN BOAST

A LONG LASTING EXPERIENCE

A complete offer

As already mentioned, the Spark line is definitely the solution in aerospace applications for machining hard and morphologically complex parts.

Specifically, model 2100X is positioned in the very middle dimensional range of the Spark family, and HMC that boasts peculiar features such as 5-axis with tilting heads and tables, turning tables, multi-pallet systems and from 5,000 (with high torque and power) up to 30,000 software package which integrates all data collection, process and management delivering excellence providing users with quick and effective return on investment.

«We keep on working on predictive maintenance with iPum@Predict - adds Colombi - a preview solution presented at the last BIMU and reassessed at Hannover's EMO.

We are well aware that in the manufacturing world, and in aerospace in particular, it is important to have the