




Mandelli's Spark 2100 is a multitasking machine that switches fast from milling to

turning operations maintaining high precision standards



**STRUCTURE DESIGNED
TO BE MULTITASK,
HIGH LOAD TABLES,
ADDITIONAL HEADS,
LARGE TOOL MAGAZINES AND
EFFICIENT TOOL CHANGE SYSTEMS.
THESE ARE THE STRONG POINTS
OF THE NEW MULTITASKING
SYSTEM DEVELOPED BY
MANDELLI AND SPECIFICALLY
INTENDED FOR THE ENERGY
AND AEROSPACE CUSTOMERS.**

[AEROSPACE E OIL&GAS]

by Davide Davò and Edoardo Oldrati

Born to be multitasking

Being able to go from the raw material to the finished component in a single setup is one of the main requirements expressed by companies in those sectors, like the Aerospace and the Oil&Gas ones, where the mechanical components to be machined present considerable geometric complexity and must be machined with very strict tolerances. One answer to this need is the use of multitasking machines, or multifunction systems, capable of quickly alternating milling operations and turning ones thus guaranteeing high accuracy in machining also thanks to the ability to carry out the machining cycle in a single setup. It is a flexible and efficient production technology whose potential in terms of precision and productivity are well known to Mandelli, a 100% Italian capital Piacenza-based company that, since 1992, has manufactured multitask systems and has recently expanded its Spark range with the introduction of a new model.

Greater precision

«The new machine is an extension of the mill-turn multitasking line to the size of a Spark 2100 A / T - begins Marco Colombi, Mandelli Sales Manager - The decision to complete our range of multifunctional solutions with the addition of this model derives from the recent spread of multitasking machines in particular in the



The new Mandelli machine SPARK 2100 A/T represents an extension of the turning-milling multitasking line

Aerospace and Oil&Gas fields, areas where Mandelli has generally focused its attention». A spread dictated by the greater precision required by these industrial sectors to which the multitask technology responds by providing the opportunity to finish the work-piece in a single setup.

«If you think, for example, about the production of aircraft engines, the advantages resulting from the use of solutions such as Spark 2100 is evident - continues Colombi - these engines are in fact mechanical parts featuring an extremely complex shape requiring both turning and milling operations that must be performed in compliance with very tight tolerances. If you do not have a multi-purpose machine, it is always necessary

to constantly move the component being worked from the machining center to the milling vertical lathe, resulting in loss of references and then an inevitable decline in precision».

The above example by Mr. Colombi with respect to the manufacture of aircraft engines provides an additional opportunity to analyze a further strength of the multitasking plants. The production of engines by means of a milling center and a lathe, in fact, requires the work-pieces to be continuously moved from one machine to another, a task that, in addition to reducing the level of precision in the final component also entails a considerable increase in the flow time.

BORN TO BE MULTITASKING

«In general, the adoption of a multifunction machine such as Spark 2100 allows for the reduction of setups with a consequent reduction in the number of work-pieces waiting to be machined - continues Colombi. The result is a leaner process flow, aligned to the Lean Manufacturing themes and Industry 4.0, two issues to which today's businesses are particularly sensitive».

The key is in the project

Accuracy and ability to streamline the production flow are two strong points of multifunction solutions and in particular of the new Mandelli solution, which has made Spark 2100 to meet the customer's needs by integrating innovative solutions and technologies

The new machine can house work-pieces up to 2 meters in diameter and 1.8 meters in height

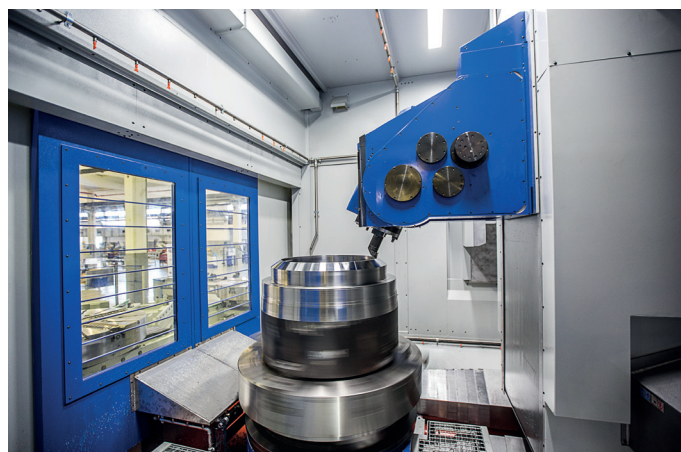


historically present on their machines .
«One of the main aspects of this machine is represented by the design philosophy

with which the basic structure has been developed - explains Colombi - This is not a milling machine that has been converted into a multitasking machine with the addition of the turning table, but a solution born to be multi-functional from the beginning. With this in mind, we decided to equip Spark 2100 with a turning table fixed in the HMC base thus configuring the machine as a vertical lathe, a strategic decision that allows the plant to obtain performances undoubtedly higher than those of a milling machine which is converted into a lathe at a later time».

The achievement of such performances is also related to a series of devices that equip the rotary table, among which we highlight the balance control device which is capable of calculating the position and the magnitude of the imbalance : a solution of fundamental importance to reach the tight geometric and dimensional tolerances during turning operations. Also for the turning table, as well as for the HMC general structure, the basic constructive choice is fundamental according to which this element has been developed.

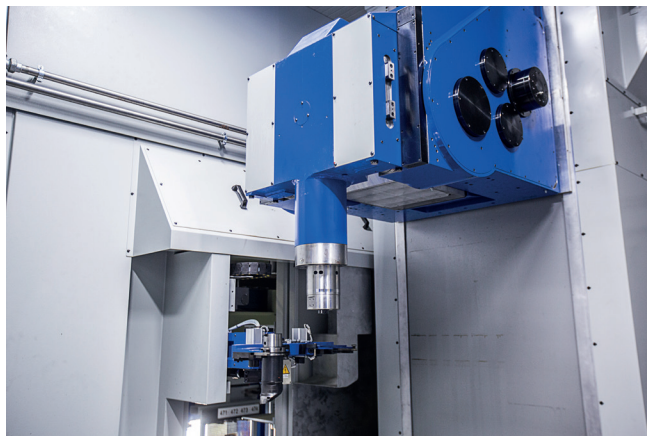
Aiming at the energy and aerospace sectors, Mandelli favored a high load solution, given the size and weight of the components that characterize these industrial fields. The new Mandelli machine is in fact able to machine mechanical parts up to a 2-meter diameter and a 1.8-meter height, while the maximum capacity is 7 tons.



Spark 2100 is equipped with a turning table fixed onto the machine base which configures the machine like a vertical lathe

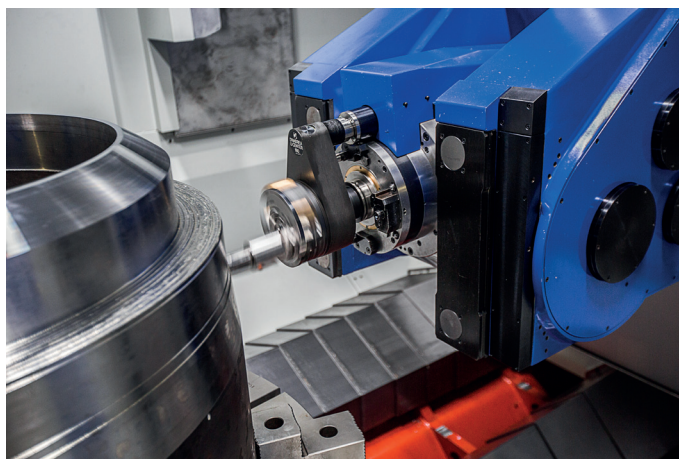
The load/unload station features precision characteristics that equal the rotary table's: the work-piece is centred outside the working area to guarantee continuous operations and downtime reduction.





The tool change times are lower than 8 sec. thanks to an intermediate buffer station which makes the tool to be used ready in advance

Spark 2100 is ideal for turning and milling operations requiring tight tolerance values



SPARK 2100 PROVES TO BE VERY COMPACT AS ITS FLOOR SPACE IS ONLY 15 X 9 METRES, COMPLETE WITH **ALL THE ACCESSORIES**

To ensure this load capacity, the company has developed a system of bearing supports (patent pending) able to maintain the characteristics of the machining center unaltered. In detail, it is a system that uses a combined bearing typical of milling rotary tables to which a second bearing is added, inserted in the structure of the table and serving as a thrust axial bearing. It is this second bearing which is appointed with the task of supporting the pieces and tables load which, in multitasking machines, are often constituted by platforms with self-centering

or independent jaws thus having an important weight.

The importance of the tool magazine

The wide application field does not mean a bulky system : Spark 2100 in fact proves very compact with its floor space of only 15x9 meters, values that refer to the complete machine with all its accessories including the tool magazine (with a number of places ranging from 100 to 530 within which can be housed tools with a maximum length of 700 mm and a maximum diameter of 425 mm), and the pallet

A QUALITY AFTER-SALES SERVICE

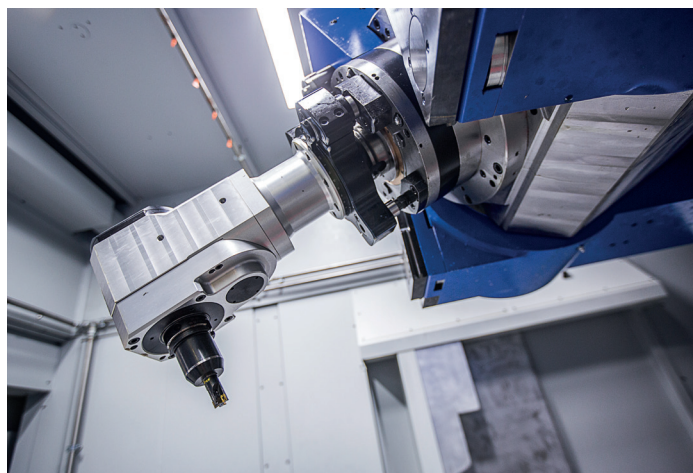
The new solution implemented by Mandelli proves to be high level, and the after-sales service provided by the manufacturer is not far behind, as Marco Colombi explains. «Our goal is to provide a 360 ° service the same quality as the machining centers we sell, establishing a partnership with our customer that goes beyond the normal boundaries of the supplier/customer relationship. With this in mind, we are structured to provide a broad range of solutions including scheduled maintenance, teleservice and possibility to extend the service contracts as the requires. All this, assuring the flexibility and speed of intervention in Italy as much as abroad, where we have direct branches with technical service in North America, China and Belgium. In other countries, where we have lots of machines installed, we use local partners that ensure first intervention, which is replaced or integrated by our technicians only if needed. The excellence of the service, together with the generous design of our machines, allow machines Mandelli and maintains the long value over».

handling systems which allow for the handling of up to 5 pallet tables. The decision to equip the machine with such spacious tool magazines is related to the complexity of the work-pieces machined in the Aerospace and Oil & Gas sectors, which require the use of a high number of tools and the need, more and more spreading even in these areas, to guarantee the non-stop operation of the system without the operator intervention. «To get tight timing schedules in the tool change despite the significant size of the magazine as well as the tools, we have created a group

BORN TO BE MULTITASKING

Left: to get the maximum flexibility, the HMC can be equipped with a robust angular transmission head for the execution of radial machining operations inside cylindrical components

Right: the Mandelli HMC can complete a turning/milling machining cycle in a single setup



composed of two elements, namely an automatic tool change system (ATC) and the storage unit itself - adds Colombi - where the ATC is equipped with an intermediate buffer allowing for the pre-set of the tool selected to perform the next operation. This solution provides tool change times lower than 8 seconds, which is interesting given the size and weight of the tools handled».

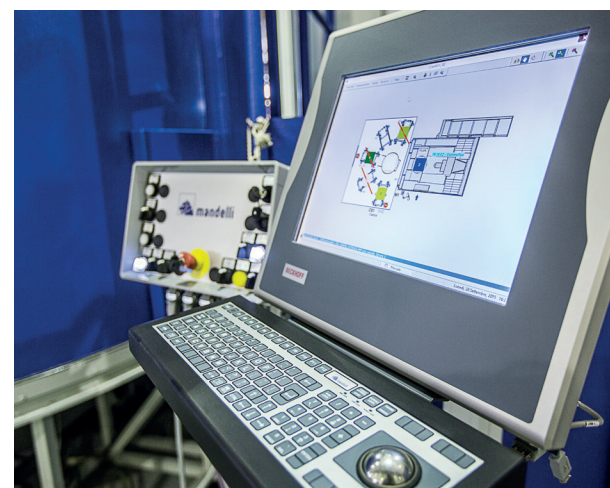
Flexibility, a Mandelli tradition

Besides the number of pockets, the tool magazine stands out for two values: the tool weight up to 35 kg and the capsizing-moment admitted, this value representing the real load limit for any machine, which amounts to 120 Nm for Mandelli, confirming

the system vocation to deal with difficult tasks. The flexibility that characterizes Spark 2100 is represented by a system that the manufacturer has been implementing on its machines since 1998: it is the possibility for the spindle head to be equipped with a fixed turning head for the execution of deep turning operations with no need to change the workpiece position thus reducing the number of setups to be carried out.

Obviously, this turning extension can be loaded automatically and it is also possible to perform the automatic tool change on the extension thus further increasing the machine flexibility.

As an option, the new version can be equipped with a robust angular transmission



head for the execution of radial machining operations inside cylindrical components, with the possibility of tool change on the angular transmission head and with a facing head unit directly on the tilting axis. All this to complete the technological versatility of the whole system.



Precision and ability to make the production process lean are two strong points of the multitasking solutions