

## APPLICATIONS

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THE TECHNOLOGICAL EVOLUTION OF CNC MACHINES REQUIRES A CONSTANT UPDATE TO CAM SOFTWARE. THEREFORE, IT'S NECESSARY TO ALIGN SOFTWARE STRATEGIES TO THE INNOVATION INTRODUCED WITH THE ACQUISITION OF NEW MACHINING UNITS, TO OPTIMISE THEIR USE, LIKE IN THE CASE OF THE COMPANY WE'RE GOING TO PRESENT IN THIS PAPER.



*5-axis machining on a CNC machining centre.*

# CAM AND CNC TECHNOLOGIES SYNCHRONISED

Creating molds is a complex task, and Flavio Gilardoni's company, established in 1961, has proven it knows how to do it right. This is attested by the market's recognition of the company, which has been making molds at its premises in Lecco, and more recently in Abbadia Lariana, for more than 50 years.

From meeting with Flavio Gilardoni, owner of the aforementioned company, we gain an interesting insight about the role that technology, in its many shapes, has played in the development in such activity and in the growth of the company, allowing it to operate on an international level. The main activity of Flavio Gilardoni's company is designing and creating molds for die-casting processes in aluminum and magnesium, with the purpose of creating components for the automotive and consumer electronics sector, though there are projects involving the industrial sector as well.

Therefore, we're talking about complex molds of big dimensions, whose creation must take into consideration the rigid constraints imposed by the quality level that makes their customers different from others in the mentioned sectors.

"The market condition", Franco Gilardoni agrees with Luca Negri and Claudio Gaddi, who share the managing and operational activities within the company, "imposes a production process in which the technology has a fundamental role to satisfy the demanding requests, from the time scale to the quality of the final product, without over-

looking the economic aspects related to the mold creation and molding processes".

For these reasons, it is very important that every mold is designed with care and defined from the project perspective, but not only this. First of all, it's necessary to choose quality material which, treated accordingly, can ensure efficient production and mold duration.

Flavio Gilardoni's technical office is already involved in the initial stage of the process because when, the order is placed, it's required to set the project up according to the technology and the features of the final piece.

A wide range of CAD systems is at the disposal of the technical office in order to analyze the geometry of the mold in detail.



*Internal divisions of Flavio Gilardoni's company, Abbadia Lariana branch, where die-casting molds are created.*

Thanks to the experienced staff, after the formal and geometrical analysis, the constructional hypothesis of the mold is defined, considering all those variables which together will determine its quality, reliability, creation times and duration. This production engineering stage, shared with the customer, includes the development of the mold, an actual machine formed by several structural and functional elements, which need to be placed with care to optimise the piece and the production process.

The accurate choice of steel and standard parts starts at this stage, with the purpose to optimise the use of material and therefore the overall efficiency of the mold.

The choice of the steel in particular is made by the company, considering the experience of the supplier and the material compliance to the hardening and thermal processes which it needs to go through in order to enhance the structural qualities. Of course, every variable in the project is framed with the specific productive context of the company, taking into consideration the resources at the workshop divisions for the mechanical machining required for the construction of the different mold parts.



*Type of piece for the automotive sector obtained by die-casting process using Flavio Gilardoni's molds*



*Complex molds, actual automatic machine tools, are part of the company production for international customers which operate within the automotive sector.*

## Resources and Technologies

"We have always thought it fundamental to have the most modern design and production technologies at our disposal", emphasises Flavio Gilardoni, "and it's in such direction that, under the guidance of specialised staff, we're constantly searching for solutions that improve the entire production cycle, taking advantage of the highest potential offered by modern technology.

We're referring to the technologies connected to milling machining, therefore to the CNC machining centres, and to the software which allows us to use them to their best, enhancing their potential to optimise their performances".

The recent renovation of the company machines responds to the need for having at our disposal machining centres that are able to handle high speed milling of large dimensions.

The modes these machining centres are asked for are from 3 to 5-axis, and also they require an important structure in order to produce molds of big dimensions and to reduce the mechanic movements which could affect the machining precision.

Among the characteristics pointed out, in the production divisions you can find several CNC 5-axis machining centres, such as Deckel Maho Dmu60, Microcut mcg 5x800 and Huron kx200, acquired recently.

This machine range allows you to perform any kind of milling machining, from 2.5-axis to continuous 5-axis. This is what's needed to create structural mold components and complex matrixes for the moulding of the pieces, especially in the automotive sector, which often require molds of big dimensions and complex shapes.

The functional characteristics of these machining centres guarantee that the target quality is achieved and enable innovative production methods, which can be of significant economic benefit.

For instance, a reliable functioning machine, with a resistant structure, can provide a continuous service, which positively affects the system productivity.

In line with this goal, in June this year the new OKK HM 1000 machine has been introduced which, in conjunction with Delcam programming systems, will significantly improve the quality of mold-bases and big matrixes. This is with, thanks to the potential that this machining centre offers in the drilling and tapping operation, also in the roughing, semi-finishing and finishing of big matrixes and mold-bases.

## CAM evolves with the machines

To ensure the optimal performance of a milling centre, it must be provided with appropriate toolpaths from the CAM software, which means defining toolpaths that reduce roughing times and still get the finishing standards required. When defining a toolpath, it is necessary for the programmer of the milling centre to pay attention to the technological parameters linked to the characteristics of the material and of the tools to be used. This way, they can define suggested strategies to exploit the machine's potential, from the most sophisticated 5-axis machine to more traditional ones.

In the last few years the technical office has added Delcam PowerMILL to the currently used CAM systems, using it for the most complex machining on the recently acquired machining centres.

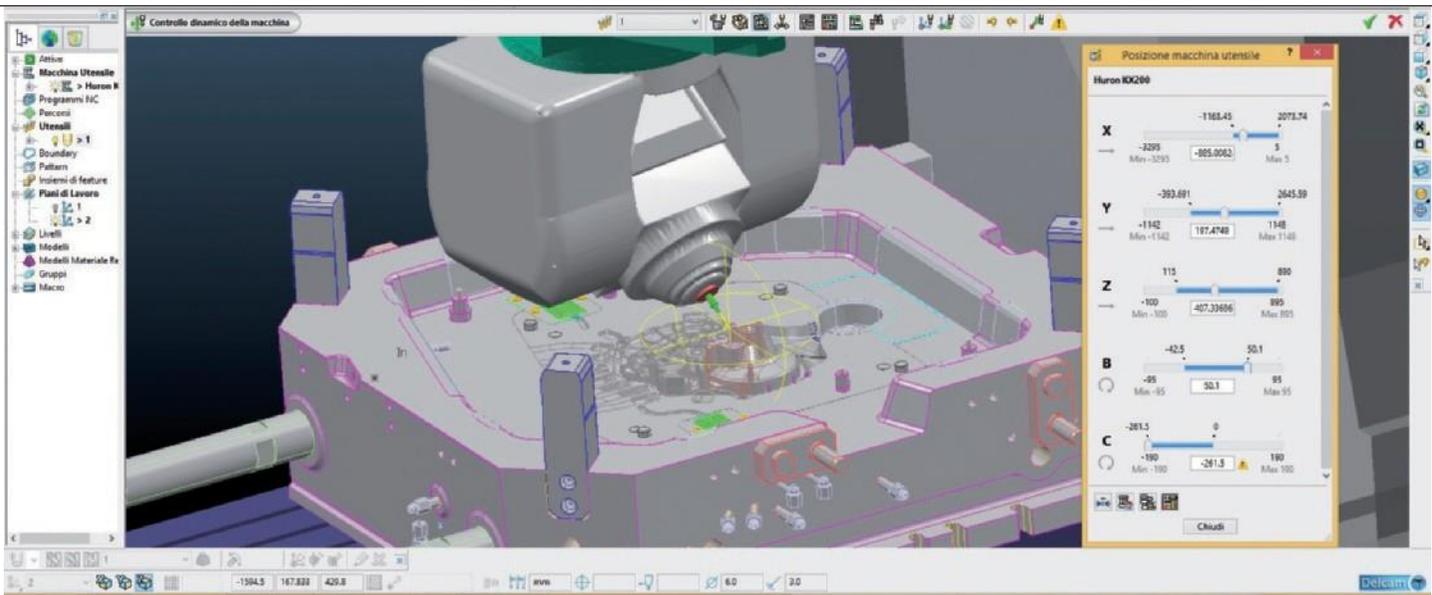
In the process of choosing PowerMILL, the focus was not only on the characteristics of the complete solution of the package, but also on the possibility of virtual simulation of the toolpaths. PowerMILL's virtual simulation considers not only the tool and the part, but also the geometry of the machine and the fixtures with which the tool could collide.

To make the best out of the potential of the machining centres advanced as the ones adopted by Gilardoni Flavio it's important that each toolpath may be virtually simulated to guarantee the avoidance of movements and collisions that may compromise the machine itself.

This condition gets even more relevant when it comes to

*From the right, Gilardoni Flavio, company owner, next to Pozzi Paolo, Delcam representative, and Gaddi Claudio, CAM activity responsible.*





*Dynamic control of the Huron KX200 machine, in a virtual simulation in PowerMILL.*

dealing with complex machining from the geometric point of view, as well as the ones requiring 'dynamically changeable 5-axis' toolpaths .

PowerMILL offers operative functionalities and modes which fit well in the conditions of the modern machining centres adopted by Gilardoni Flavio.

The results achieved since the technical office started working in such a CAM environment are consistent with the quality and performance targets that the company established when it had been decided to implement the most modern CNC technologies.

CAM activity is not only about the optimisation of toolpaths to make the most out of a machine's potential, but it is also about the verification and the compatibility of the toolpaths with the geometries involved in the actual manufacturing dynamic.

The importance of this verification becomes a priority if you consider that the aspects of the general productivity of the machining centres are related.

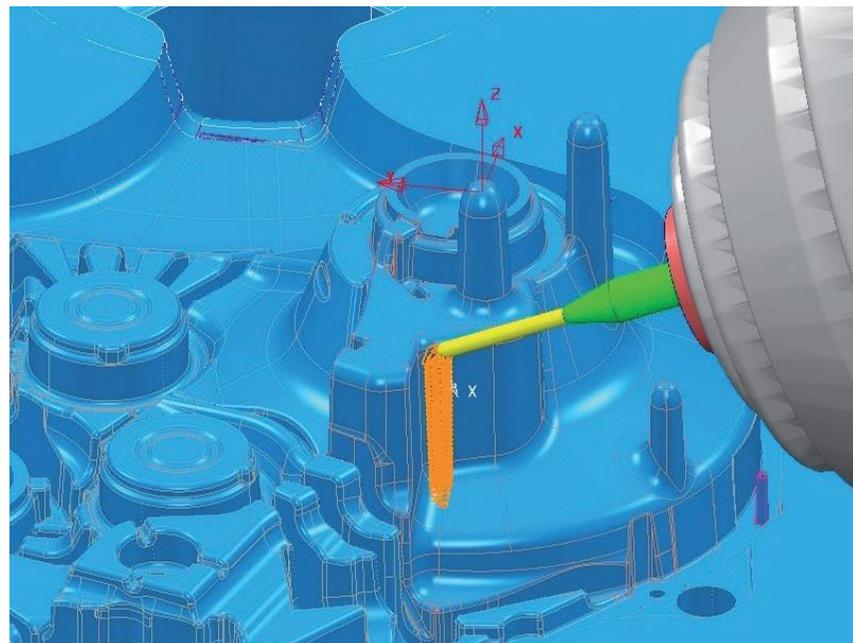
Being able to work in complete safety means it's possible to exploit the machine at its best, allowing the machine to work even without direct supervision by the operator.

With that prospective, PowerMILL software, with its simulation functionalities, is a key part of the production process, where unsupervised production by the new machining centres is a real and actual bet for the future.

The technological matters, which give reason by themselves, are not only about the most complex and sophisticated 5-axis machining, but they cover also the widest range of machining necessary to implement the fixtures.

From the point of view of the software, precise support comes from FeatureCAM which, with its specific 2.5D mode, is extremely efficient in the moulding manufacturing and every other kind of fixture, besides PowerSHAPE software, mostly meant for electrode design.

At the moment, the people operating in the technical office split the tasks according to the different machining, working either



*Machining details in Delcam's virtual environment*

in PowerMILL and FeatureCAM environment, making the most of the potential of both software packages and sharing the common easy way of use.

Positive results can be already seen in the CAM area, however they are not just the simple outcome of the functionalities expressed by these software packages, but above all, as the staff of the technical office itself explains, of the collaborative relationship with the technical staff of Delcam Italia.

If it's true that the partnership between client and supplier is essential for a good project result, it's also true that the technological partnership between Flavio Gilardoni's technical office and Delcam Italia's technical office has turned out to be particularly useful in the implementation of an optimised method compared to the technological resources adopted by the company.

This has happened thanks to a successful exchange of ideas, which allowed the natural development of growth, enabling the technological evolution agreed in the company adopted strategy and the subsequent decision making happen.