



# AMM

## ▶ ADVANCED 5 AXIS MODULE

### CHARACTERISTICS

#### Cinematic Simulation

The cinematic simulation module allows a realistic representation of the whole CNC machine showing the movement of all axis, both linear and revolving. The aim is to avoid unnecessary attempt on the real machine and to be sure to work the piece without any problem related to limit switch or collisions with the equipment

#### Collisions' control

During the machining all surfaces of the work piece and of the toolholder are in risk of collision. In this case the AMM module gives many options to avoid these risks using, if necessary, different orientations of the axis. Anyway the surfaces that are not worked to avoid collision, could be selected in order to be verified

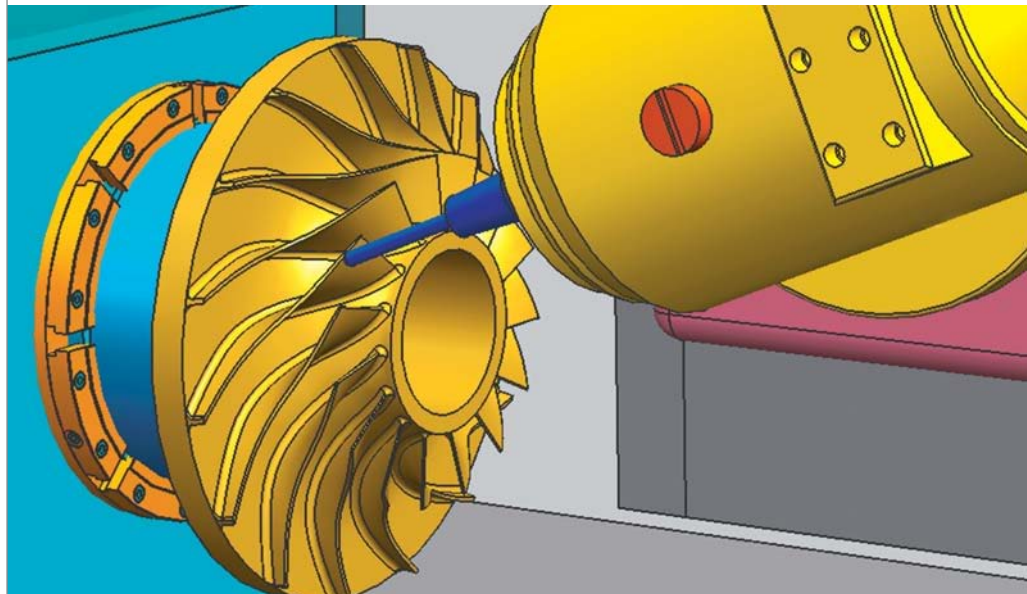
#### Multi-axis Postprocessor

Most of 5 axis machines' postprocessor are available. Additional postprocessor can be developed in order to satisfy client's need. Furthermore it is possible to draw and activate the geometric part of any 3 or 5 axis machine, in order to be able to display it on the cinematic simulation

The Advanced Multiaxis Machining module, empowers SUM3D performances, providing new and multiple working strategies from 3 to 5 axis.

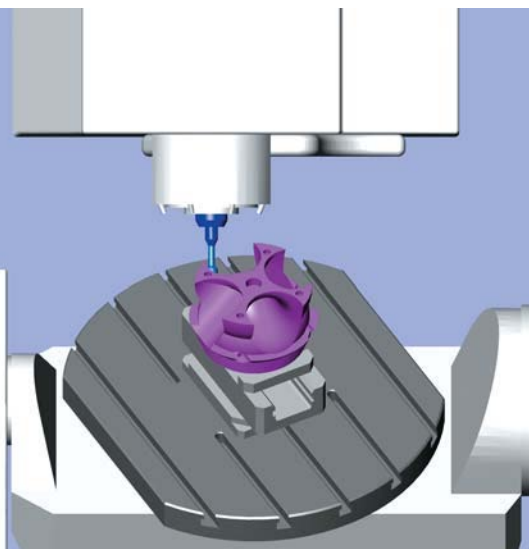
Those potentialities allow effective problem-solving in programming multifunctional or robot 5 axis machines.

The aim is to reduce machining time for the phases of roughing, semi-finishing, re-machining and finishing and to obtain the piece all done avoiding post machining operations to re-positioning or re-finishing it with the help of other technologies (for example with electrodes).



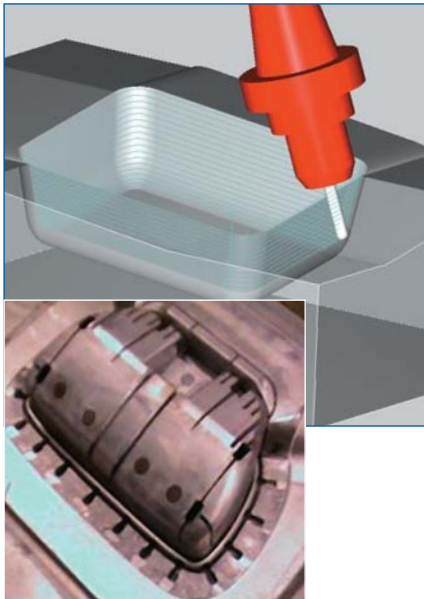
### MAIN FEATURES OF THE MODULE

- Multiple strategies to calculate the 4/5 axis toolpath
- Advanced systems for the orientation of the tool's axis with the possibility to handle the tool contact point and to determine the working area. Orientation can be applied also to 3 axis' SUM3D standard machining.
- Four levels of collision's control, for all the tool movements in contact with the piece and during re-positioning. These controls are performed both on machining surfaces and on additional surfaces selected by the user (for example tools)
- Full connections control, meaning all the movements to be done in case of path suspensions (fissure or parts not to be machined) between the job increases and the connection/disconnection
- Control of the security area given by plans, cylinders or spheres.
- Control of the rough that consents to avoid any eventual empty toolpath.
- Control of the multiple roughing strategies optimised for specific needs (impellers or turbines)
- Conversion of any kind of parallel job steps in spiral machining.



## ▶ ADVANTAGES AND FIELDS OF APPLICATION

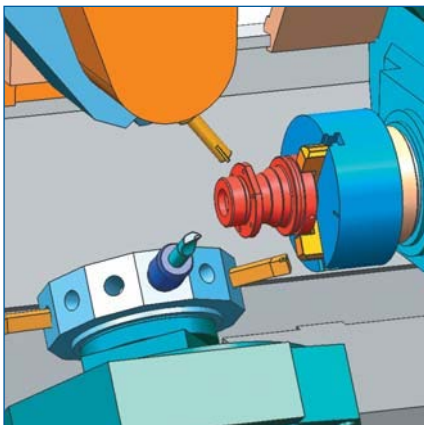
### Moulds



In this field the benefits of AMM module are:

- Possibility to work maintaining the flank of the tool always parallel to the shapeless surfaces, in order to obtain better finishing in shorter time (considering that in this case increments could be higher).
- Use of shorter tools and 3 axis machining for all the parts without tool or spindle collision. Only for collision areas the tool will be rotated by the user.
- Machining or re-machining areas with deep cavities avoiding to finish them with the electrodes.
- Machining undercut areas avoiding piece repositioning.

### Industry

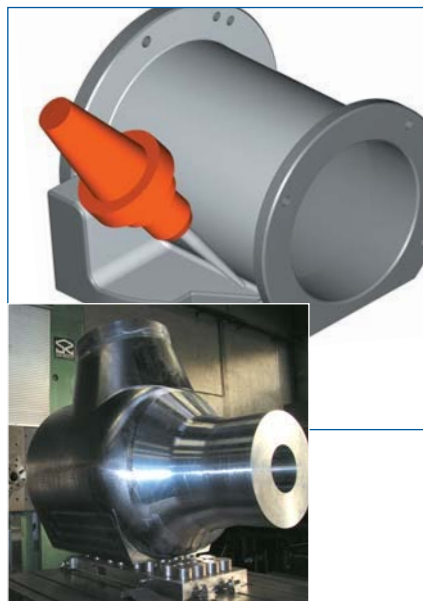


In this field to reduce machining time is a must. For this reason are often used multifunctional machines in order to produce the whole piece

with the minimum number of repositioning and the best quality. AMM fully manages the milling process with this specific features:

- roughing, re-machining and concentric finishing of any kind of cavities with 4/5 axis
- re-machining or finishing of corner or small radii areas, using the side of the tool
- particular machining for cams, pipes, impellers, turbines, wormscrews, extruders or tools.
- Toolpath control, by means of real cinematic simulation, to provide reduction of time programming.

### Specific machining for petrochemical, water and gas industry



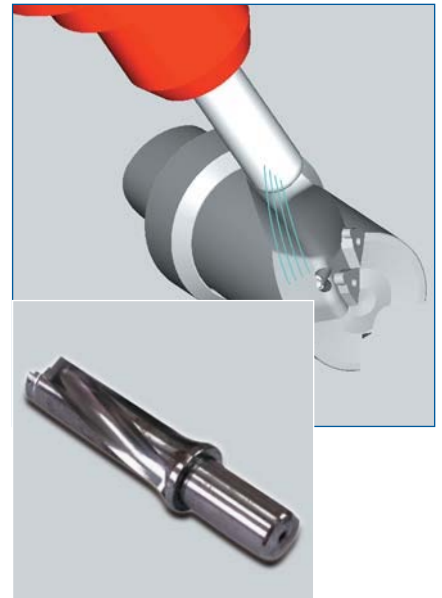
Companies producing forgings or valves, pipes, flanges will take advantages from the use of AMM and SUM3D, thanks to their specific machining optimized to obtain roughing and radial finishing managing the rotating table. In this way the working time is dramatically reduced while the quality of the finished product is considerably improved, with consequent shorten time of polishing.

### Cutting tools machining

When machining metal cutting tools, it is necessary to mill the flutes in 4/5 axis simultaneous mode. To get reduced machining time is crucial because this kind of products are very expensive. This short-time machining can only be achieved with a very smooth toolpath, which is given just by Direct-to-Bezier and/or Nurbs-Surface

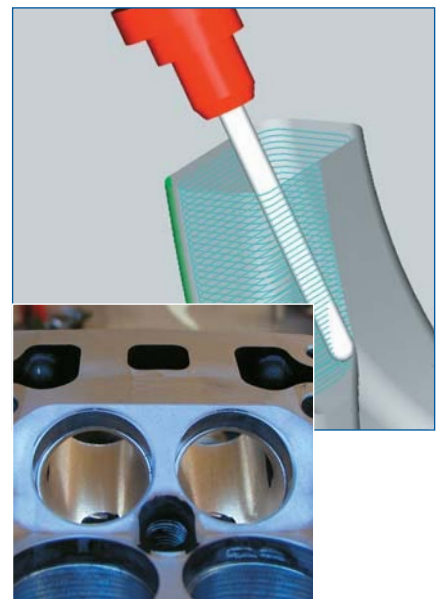
Toolpath Calculation.

The AMM module allows to obtain:



- Roughing and finishing machining with 4/5 axis or continuous positioning.
- Vertical surfaces finishing with flank tool (also in case of conical tools)
- All propeller's machining repeated to get the whole processing of the tool
- ISO 5 axis drilling or, if possible, CNC's fixed cycles management

### Exhaust Manifold Machining

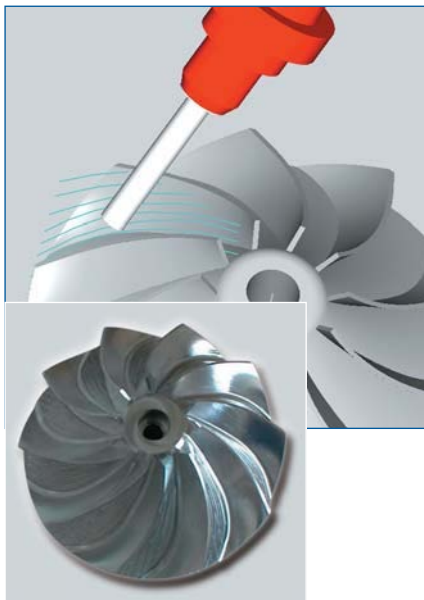


One of the most complex task in building motors prototypes is milling the exhaust ducts of the cylinders.

With the help of the multiple strategies of machining available AMM provides a consistent reduction of processing time.

It's possible to perform a perpendicular to curve machining and manage the movements of approaching, detaching and incrementing always with a user-defined curve.

Besides, AMM Multi-Step collision control provides all the options needed to combine multiple collision avoidance together with the ability to handle undercut tools like  $\frac{3}{4}$  sphere cutters.



### Impeller and turbine machining

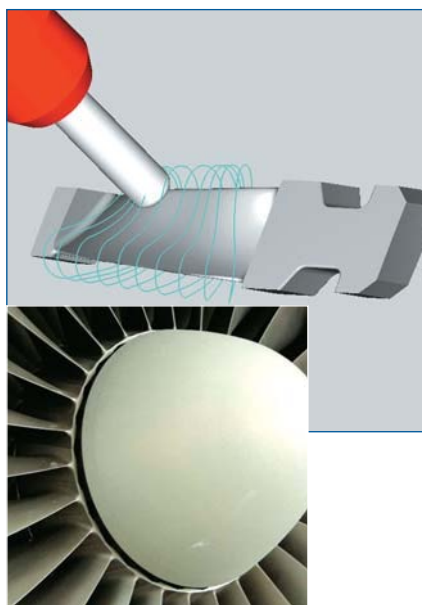
Machining of impellers and turbines is one of the most complex kind of milling. Best results in machining of impeller ribs, are achieved using conical tools with deep cut steps based on the stock definition of upper and lower surface.

Another important feature of AMM is the ability to dynamically adjust the federate speed and the maximum distance between programmed points of the axis.

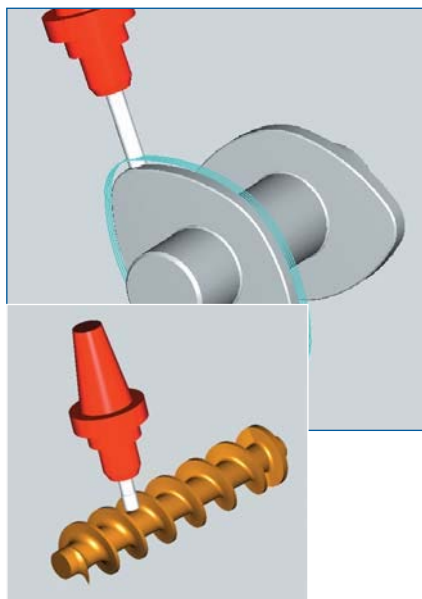
### Machining of turbine blades

Turbine blades have always been a test to prove the efficiency of a 5 axis CAM system. AMM is able to calculate roughing, re-machining, semi-

finishing and finishing toolpaths with the ability to automatically handle cutting planes and the relative tool's angle. This allows a great reduction of the programming time as toolpath changes are realized in an very short time. Multisurface finishing, with the use of bull nose end mills and thanks to AMM's ability to detect collisions between the tool and the piece, improve machining time. In this case can be used a spiral toolpath too.



### Eccentric machining and mill turning



AMM offers multiple functions for Eccentric Shafts machining. Camshafts and connecting rod can be milled

with simultaneous 4 Axis with collision check. Other applications are complex particulars like wormscrews for plastic and rubber injection moulding. It's possible to plan multi-step toolpaths for roughing and finishing avoiding unnecessary tool's moves also in case of very complex surfaces.

### Particulars for shoemaking industry

AMM allows undercut parts machining without re-positioning of the piece.

For instance it's possible to generate a 5 axis spiral toolpath to work the whole heel.

Furthermore, in case of machining of matrix with undercut areas, deep cavities or corners, the tool's dynamic angle can be managed depending on collisions.

In this way there's a 3 axis toolpath without collisions and a 5 axis one where the tool starts to collide.

### Shipbuilding industry machining



AMM's flexibility allows to program both removal and deposit machining, very used in shipbuilding field.

Especially in case of machining of keels, the multiple strategies that AMM and SUM3D offer can meet the production requirements.

## ADVANTAGES AND FIELDS OF APPLICATION

### Machining of marble particulars



Many machining techniques for marble have been included in AMM to work with 5 axis and/or with turning functions' CNC. The specific features studied for this field are: roughing or finishing using disc mills, machining with shaped tools, polishing and managing the technological part on the basis of the specific tools used in this industry.

Furthermore there are optional modules available for the machining management starting from laser or mechanical digitization of parts to be realised duplicating a sample (logos, plaques, capitals and statues). The mesh surfaces coming from the scan can be machined with 5 axis AMM also with disc tools.

### Machining of wooden parts

AMM's functionalities, together with SUM3D's, allow to realise toolpaths to fit the purposes of the furniture industry and of the companies producing custom parts. To machine standard parts for industrial production it is possible to create repetitive schemes to be applied to the different models.

For all those companies producing custom parts, the simple and flexible AMM module allows to perform toolpaths to machine any complex shape.



### Lase cut machining

AMM can machine curves projected on surfaces in order to produce cuts of parts like metal sheets, plastic or aluminium.

Multiple possibilities of orienting the laser head, even through a series of vectors drawn by the user, enable to accurately manage all positions of the axis in each area. This strategy, together with optional solutions for the cell management, allows to program laser robot too.

