# What makes a modern CAM system?

**tebis**

**CAD/CAM MES**
Software & Services

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High-quality results, automated processes, efficient work procedures and maximum safety in manufacturing – the demands on modern CAM systems are high. The CAM system is a very important part of every manufacturing company and can determine its current and future competitiveness. So what is a CAM system at present and what parts are important?

In this report, our experts provide an overview of the most important features a CAM system should have – and they explain in detail what specific added value they provide.
You can benefit from these insights in your own site assessment and evaluate how up-to-date your current infrastructure is.

Many aspects of CAM software influence efficiency, quality and safety in production. They come to bear in various steps of the process chain. The application spectrum is therefore an essential characteristic of modern CAM solutions. In other words: A single software system should work with as many work procedures as possible, from design (CAD) to manufacturing (CAM) and quality control (CAQ) – whether for manufacturing large/small parts, simple/complex geometry or single parts/small series. It should also support as many different manufacturing technologies as possible, such as milling, turning, drilling, hardening and the latest machine kinematics with multiple axes as well as robots. With Tebis CAD/CAM software, users design 3D CAD models for a wide range of manufacturing areas and automatically calculate NC programs for their NC-controlled manufacturing and quality testing. This way, orders, from simple to highly complex parts, can always be completed on time.

# End-to-end efficiency, high quality and safety

This single-system strategy makes the manufacturing process more fluid, faster and more transparent. Benefits can be seen as early as the work preparation stage. Instead of working in the machine shop, the NC programmer works on a large monitor in a quiet office. As a result, the machines are always productive. In addition, errors are minimized because the information from the CAD model is sent directly through to the machine with no loss of precision. The machine operator ideally also uses the CAD model and receives clear instructions for setup and required tools – with no manual entries or paperwork. All data remains in a single system from the very start. This is efficient and less susceptible to errors and standardizes machine operation.
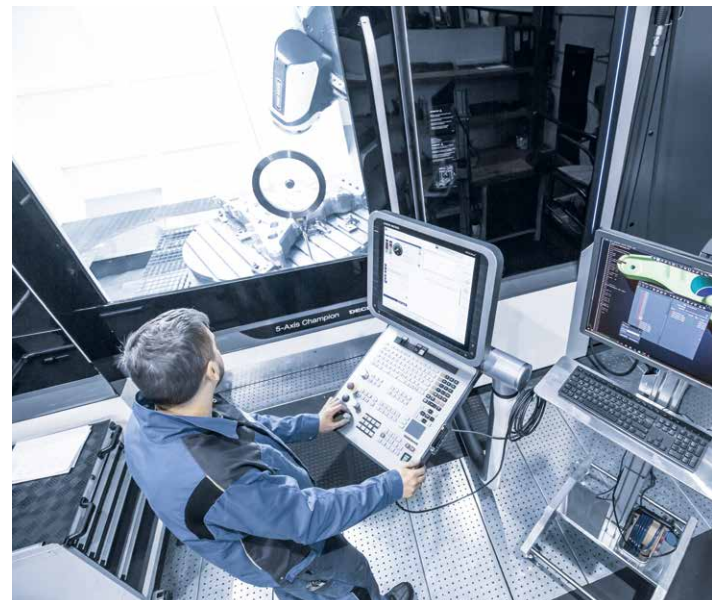


*CAM with a single-system strategy: From design to machine, the data remain within a CAD/CAM system across the entire process. As a result, companies can reduce errors, provide machine operators with clear digital specifications and improve the standardization of their manufacturing.*

# A revolution in manufacturing

Some CAM systems enable work with digital twins, i.e. true-to-life representations of the physical tools. Modern solutions do even more: They know every detail of the company's manufacturing environment and have access to its unique manufacturing knowledge. This ensures greater safety and standardization and enables automated programming and manufacturing. System-specific libraries contain true-to-life digital representations of the machines, controls, tools, clamping devices and units with their respective geometric and technical properties. The individual manufacturing knowledge is contained in templates and libraries. This gives every user access to proven methods after only a short training period. In automatic mode for related machining tasks, NC programmers select suitable machines in the virtual environment, define the optimal setup and select corresponding machining templates. A modern CAM system like Tebis then selects suitable and available tools and calculates collision-checked NC programs that are optimally matched to the manufacturing environment.

*Digitalizing the manufacturing environment: Detailed virtual representations of elements such as machines, tools, clamping devices and units are integrated in the Tebis CAD/CAM system with their respective geometric and technical properties. This provides for greater safety, standardization and automation in programming and manufacturing.*
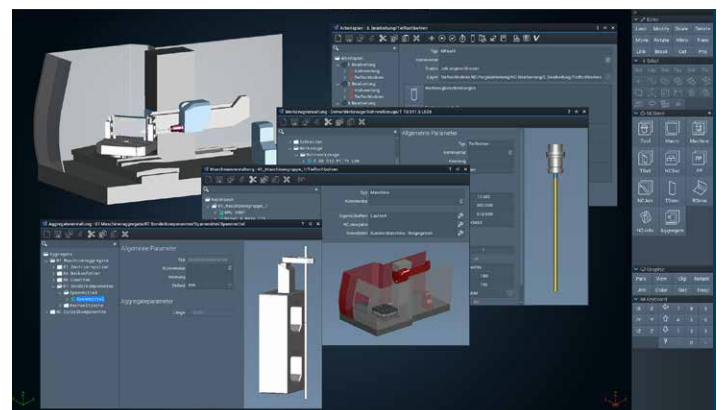
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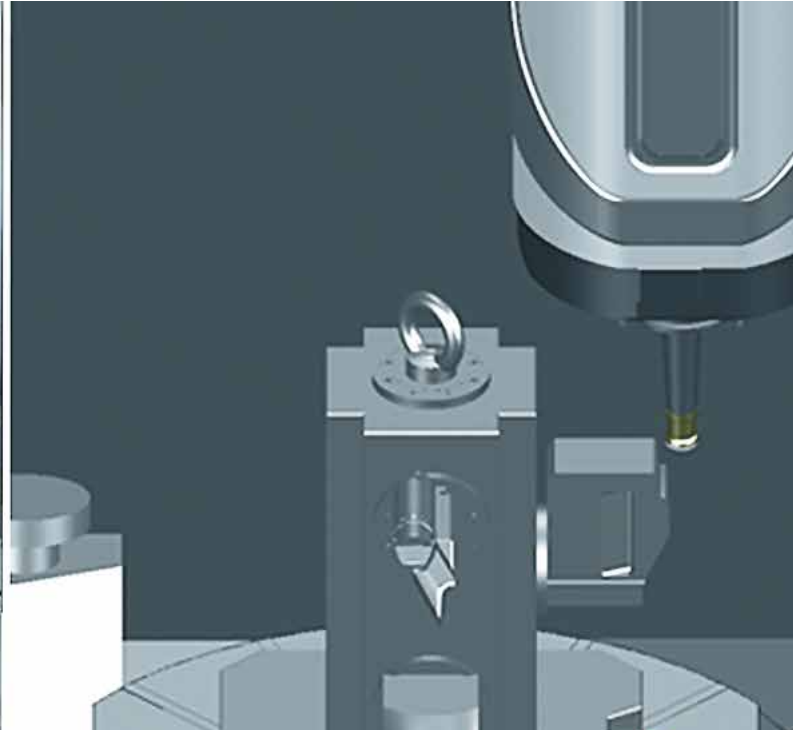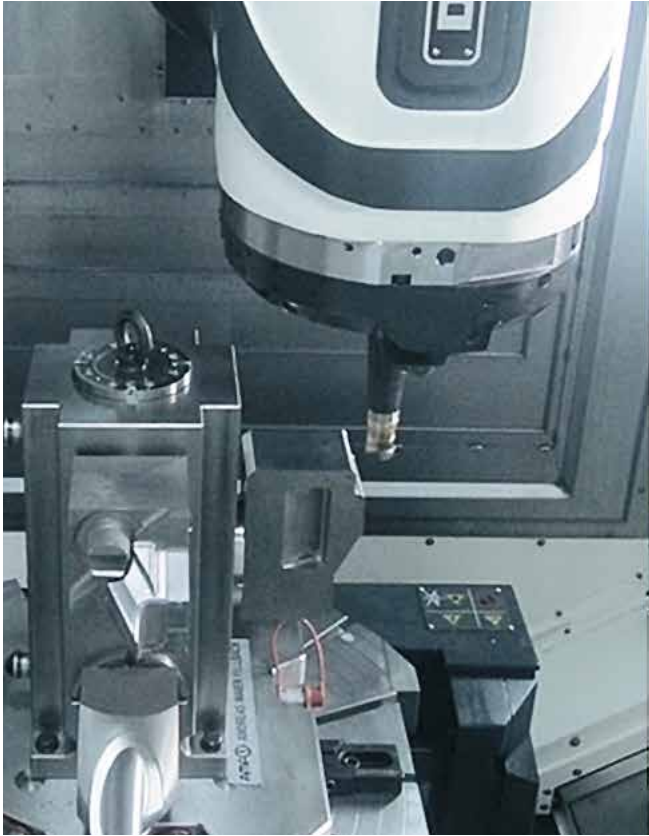
*Real (left) and virtual machine environment in Tebis: Users of CAM systems including simulation technology achieve a high level of safety with a high degree of realism. Users check calculated NC programs in the virtual CAM environment.*

# Integrated simulation for maximum collision safety

CAM solutions with integrated simulation technology provide a high degree of safety. Such systems also offer a high degree of realism when defining the setup because users check calculated NC programs in the virtual CAM environment. CAM systems with access to digital twins detect possible collisions and limit switch problems already during calculation of the NC paths and automatically avoid them, for instance by reducing milling areas and with 5-axis avoidance.

# What affects manufactured surface quality

Modern CAM systems lay the groundwork for high-quality parts and the corresponding degree of NC automation in the manufacturing design stage. Depending on the manufacturing technology, NC programmers use CAD functions to prepare their manufacturing models for subsequent NC processes. Of course, NC free-form surfaces can only be as good as the underlying CAD data. Good CAM software is therefore also characterized by powerful integrated functions for structuring, designing, re-pairing, morphing, scanning and reverse engineering. For the quality of manufactured surfaces – especially for free-form geometry – it is also critical that the CAM system calculates the NC paths on mathematically exact surfaces instead of on tessellated substitute models such as polyhedrons. To avoid manual reworking, it should also be possible for the user to influence the finish quality with adjustable NC point distributions.

# Modular and flexible in a single system

Manufacturing processes in the industry vary greatly from small and medium-sized manufacturers to the major players. A modular structure is therefore absolutely essential for a modern software solution. Users can get started at low cost and grow flexibly to meet increasing requirements. Tebis offers suitable software packages for typical CAD/CAM applications that can be expanded as design and manufacturing tasks grow. If specific add-ons are needed only occasionally, these components can be shared among users.
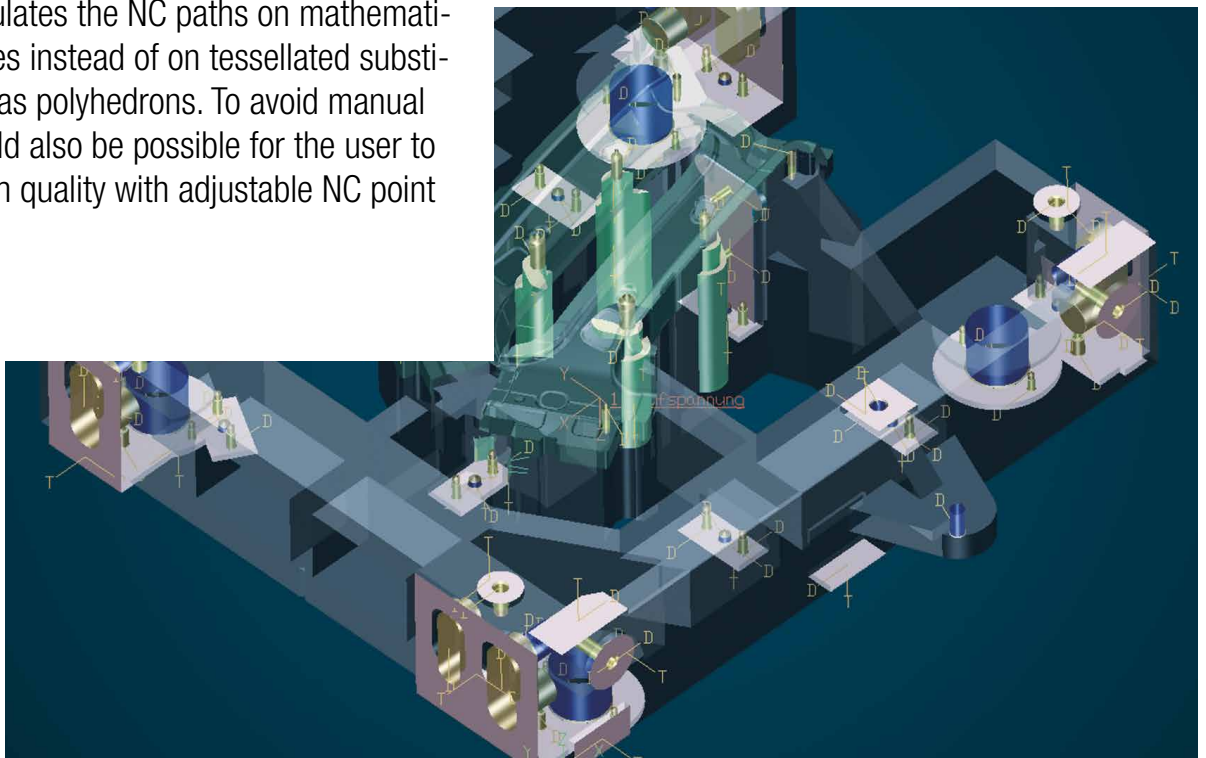
*Automated part preparation: A company's specific manufacturing knowledge is stored in features and templates in Tebis. This simplifies tasks such as part preparation for automated NC programming of planar surfaces, pockets, (stepped) bores and threads.*

# Interface and network compatibility

Finally, networking of systems has become increasingly important in the context of digitalization, and modern CAM systems are increasingly offering it. Especially user-oriented solutions are characterized by their compatibilty with other systems. Users should be able to exchange their CAD models with potential clients' most important systems via interfaces without data loss. On import, the software should automatically break assemblies down into individual manufacturing files and optimize surface quality.

Real-time connections to tool databases and software for order planning and control enable improvements in the logistical processes, yielding large gains in efficiency. For example, Tebis can be directly coupled with MES ProLeiS. In this integrated environment, manufacturing projects can be planned and controlled much better with data that are always up to date. In the highly deadline-oriented die and mold manufacturing industry, this enables companies to ensure that all machining operations and components are completed on time and that they deliver their products according to the deadline.

# Conclusion

There are many factors that go into a modern CAM system that is used on a professional level. Some factors are universal like efficiency, quality and safety which are very important in manufacturing companies. Further factors are influenced by continually growing market requirements, the digitalization of the manufacturing industry and the need to automate process flows.

## A CAM system that gives you the optimal prerequisites for all current and future requirements:

- Digitally represents your manufacturing environment (machines, tools and clamping devices)
- Lets you store your manufacturing knowledge in digital form (templates, features)
- Relieves your NC programmers of their everyday workload with templates for automated part preparation
- Ensures maximum collision safety
- Provides user-friendly CAD functions for flexible modification of the CAD model
- Is modular and flexible, enabling it to meet all current and future requirements
- Supports you in on-time implementation of your orders with CAD interfaces and with real-time connections to resources such as tool databases

Would you like to learn more how Tebis CADCAM can optimise your CNC machining processes and automate CAM programming? Also, would you like to reduce your CAM work costs as well as cutting tool and machining costs? Then please don't hesitate to contact the Tebis UK team for more information.
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