

Model-based processing responds to the current production situation

22 February 2022, 01:00

Peter ten Haaf
Samuel Milton

Adaptive machining allows specific actions to be taken in machining, based on the actual production situation. The successful application depends on the availability of correct (real-time) data and the corresponding structured and digitalised working methods. For the latter, we have developed several models which we will offer via an online platform within the 'Model-based processing' project.

The manufacturing industry is facing major challenges in several areas, including making flexible changes to meet customer demands, increasing productivity, finding the right talent and making the best use of production technology. To find answers to these challenges, people are checking out the 'Industry 4.0’ concepts: a far-reaching digitalisation of production, where (production) data is used to (autonomously) compensate for variations, integrate process knowledge, guarantee quality, etc.

The machining industry often uses the term of adaptive machining, i.e. taking specific actions based on the actual production situation. The successful application depends on the availability of correct (real-time) data and the corresponding structured and digitalised working methods. The first aspect is increasingly within reach thanks to the ever-growing range of hardware and software. For

the second aspect, we must move towards 'model-based machining', where parameterised models (formulas) are used to identify the optimal machining process.

Within the recently launched 'Model Based Machining' project, such (academic) models are further developed and converted into practical tools: online applications (apps) which run on data gathered on the shop floor, in order to make these machining models widely applicable and accessible. Specifically, applications are envisaged that provide support in determining cutting conditions. Each of the applications will be accompanied by a training package and demonstrations to facilitate transfer to and adoption in the workplace.

The models

'Optimal working zone' model, for lower tool costs

The model structurally determines the optimum cutting zone(s) for a specific material. This includes a combination of cutting conditions, tools and cooling method. The model can be used, on the one hand, in case of premature or excessive tool wear, an acute problem that can mean the difference between profit or loss on an order, while on the other hand, also for optimising overall tool use.

'Quick accuracy check' model for a guaranteed final result

For a five-axis milling machine, a ‘quick accuracy check’ model and procedure are provided to ensure at regular intervals that the machine accuracy is good.

'Stability curves' model, for faster processing without vibrations

The vibration profile of a certain machine-tool-workpiece combination is mapped out by means of a low-threshold hammer test. This allows vibration-free machining conditions to be determined.

'Cutting forces' model, for optimal machining rate

For solid carbide tools, a heat map is generated that provides insight into the possible cutting conditions in a given material. The optimal cutting conditions for different operations (roughing, contouring, etc.) can thus be read.

'Productivity' model, for a cost-efficient process

Ultimately, the individual elements or models together form a single machining process or operation where productivity is determined by the combination of it all. The productivity model combines the results of the previous models, supplemented by financial data such as depreciation and tool costs.

Online platform

The various models can be consulted free of charge on an online platform. After simple registration you will receive a link to the platform. You will find explanations on how to work with the models, but be sure to keep an eye on the Sirris agenda as well, as we will be organising both physical and online explanatory sessions.

The platform is still under construction, but you can already register so that we can send you the link when the platform goes online.

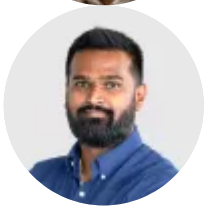
More information? Contact us!

The COOCK project 'Model-based processing' was started with the support of VLAIO.

Authors



Peter ten Haaf



Samuel Milton