SYSTEMATIC LAYOUT OF MILLING PROCESSES
SYSTEMATIC PROCESS LAYOUT – SELECTION OF TOOL AND PROCESS PARAMETERS FOR COST-EFFECTIVE MILLING PROCESSES

Shorter product cycles and steadily increasing quality requirements combined with the equally important demand for economically-viable machining processes permanently presents the field of milling technology with new challenges. In this context, a technological and economically-efficient machining process that takes production requirements into account becomes crucial.

- Which geometrical features should the tool ideally possess?
- Does a coating make sense economically, and if yes which type of coating?
- Which processing parameters can be used to achieve best performance while at the same time meeting the highest quality requirements?

These questions become more relevant when one considers materials which are hard to machine (e.g. titanium and nickel based alloys, powder metallurgy steel). Efficient milling processes are essential here, both in terms of costs and technology.

The Fraunhofer IPT has therefore developed and built an innovative test bed with which to analyze the phenomena involved in the chip formation process. This makes it possible to quickly design a specific and cost-effective milling process.

Advantages of process design via Fraunhofer IPT test bed

- Competent and efficient identification of optimization potential within your milling processes in terms of technological, economic and qualitative demands
- Standardized approach to process design
- Prevention of time-consuming and expensive reiteration loops
- Acquisition of comprehensive and reproducible data
- Access to many years of expertise on the layout of high-performance machining processes (HPC and HSC)
- Access to an innovative test bed developed by the Fraunhofer IPT for milling process design as well as to modern measuring techniques and analysis software
Our offer

On the basis of a comprehensive analysis of your technological milling operations and processes, we provide you with support and solutions in the following disciplines:

- Comprehensive analysis of the component’s material characteristics and the resultant challenges faced by the machining process (e.g. strength, hardness, carbide distribution and size)
- FEM simulated analysis of the thermal and mechanical load spectrum
- Detailed analysis of the processes and phenomena in the machining zone that are relevant to the subsequent design of the milling operations
  – Determination of mechanical and thermal loads during the machining process
  – Visualization via high speed cameras
  – Generation and analysis of process-specific chip origins
  – Metallographic qualification of tool wear, impact of the machining process on the workpiece surface zone and chips
- Tool selection
  – Macro and micro geometry (e.g. cutting edge radius)
  – Coating system
- Selection of optimized process parameter ranges
  – Cutting speed \( v_c \)
  – Radial and axial infeed \( a_r \) and \( a_p \)
  – Feed per tooth \( f_z \)
- Identification of optimum operational loads for the total “workpiece-tool-parameter range” system specific to your machining operations, taking economic and qualitative requirements into account
- Selection of milling strategies for roughing and finishing processes that meet your requirements

Our specialties

- Motivated, interdisciplinary team of scientists and technicians
- Many years of experience in the analysis and optimization of machining processes
- Realization of a sustainable improvement process thanks to our proven, systematic project approach
- Comprehensive qualification profile ranging from material and tool technology to FEM simulation techniques and process technology

You can get to know us and our methods at a non-committal, introductory meeting. We are always available to tell you about our approach and how we can customize our methods to suit your company’s needs. Just call and ask for an appointment!