Optimization of NC programs for large-volume production

Machining cycle times have a direct impact on production costs and thus are an ongoing subject of production optimization. There is continuous demand of cycle time reduction in the field of large-volume production, either before the start of production in order to meet cycle time goals, or after the start of production in order to increase throughput without adding additional production resources. Possible improvements, such as toolpath optimization, changes of the tool strategy or fixture design optimization, quite often can not be implemented, because machine tools are exclusively allocated to the production and are not available for online implementation and testing.

Reduction of setup times

Testing NC programs often significantly reduces available machining capacity, especially when manufacturing complex workpieces in single or small batch sizes. A major reason for this situation is program errors, which can not be detected while writing the program due to insufficient simulation capabilities in the programming environment. As a consequence, program verification exclusively takes place at the machine, when running the program for the first time. eM-RealNC provides the perfect environment to detect program errors offline at a very early stage. The benefits are reduction of setup times and cost savings by avoiding collisions and damage.
to machines, fixtures and tools. In addition, eM-RealNC helps increase available machining capacity by significantly shifting program testing from the machine to the offline simulation environment.

**NC simulation of post-processed G code**

Today most CAM systems provide simulation capabilities. Within these systems simulation typically is based on a generic representation of the machining process instead of machine-specific, post-processed G code. This results in significantly limited simulation capabilities: errors created by the post-processor cannot be detected, the accuracy of cycle time calculation is insufficient for optimization and the simulated toolpath geometry deviates too much from reality. In total, simulation results based on non post-processed G code are not reliable enough, and the simulation does not realize potential benefits. For this reason, NC simulation in eM-RealNC is always based on machine-specific G code executed by accurate and comprehensive controller models.

**Features continued**

- Close to reality visualization of workpiece and chuck during combined milling and turning processes
- Graphical sectioning during turning
- Combined geometrical and process-based collision detection
- Dynamic material removal simulation
- Dynamic display of relevant controller data while the simulation is in progress
- Realistic 3D visualization
- Support of multi-channel machining processes (such as two-turret turning machines and special large-volume production machines)
- Simulation of automated machining systems:
  - Multiple stations per simulation scenario
  - Transfer lines
  - Flexible machining systems
- Support of specific methods typically used in large-volume production:
  - Multiple workpieces per setup
- User interface: data display for axis values, program variables and tool data
- Tool-specific coloring of machined surfaces

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