Machining Line Planner

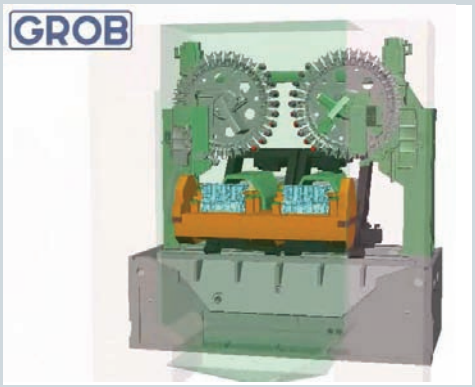
A powertrain machining line planning solution for instances when every second counts

Benefits for OEMs
- Reduce investments by minimizing the number of necessary machines in the line
- Reduce planning time
- Eliminate mistakes by improving manufacturing plan reliability
- Reduce rampup time
- Increase throughput
- Optimize the design to reduce manufacturing cost

Benefits for line builders
- Win more proposals
- Reduce proposal time
- Improve proposal reliability and quality
- Standardize proposals by using best practices
- Reduce engineering time and effort

Features
- Feature-based NC programming
- More than 120 predefined machining features
- Extendable machining feature library
- Optimized machining operation allocation and sequencing
- Automated design change management

Summary
Tecnomatix® software's Machining Line Planner enables manufacturing planners to design machining lines for OEMs and machining line builders. This application provides a full range of process machining tools for machining lines that consist of any number of general-purpose machines or transfer line units. The application helps planners to design, program, simulate, optimize and document machining lines for proposal and build.



GROB multi-spindle engine block machining center programmed using Machining Line Planner.

The machining line is a highly optimized sequence of manufacturing operations programmed to perform high-volume production of complicated components in succession on dedicated machines. To help companies optimally utilize their machining resources, Machining Line Planner provides a process-based solution that simplifies and accelerates the design and optimization of machining lines. Machining Line Planner enables you to define the machining details for individual features on each machine and scale up to operation ordering, balancing, and optimizing the entire line.

Defining machining operations and selecting tools
Machining Line Planner automatically analyzes part geometry for manufacturing features, such as stepped holes, pockets, slots and grooves, as well as manufacturing requirements, such as tolerances, surface finish and threads. The Machining Line Planner library provides more than 120 predefined manufacturing features. This library can be extended to include customer-specific features.

Machining Line Planner automatically matches manufacturing features to their corresponding manufacturing operations. Manufacturing operations describe the machining methods and manufacturing resources for each feature. Operation definitions include information about customer-specific

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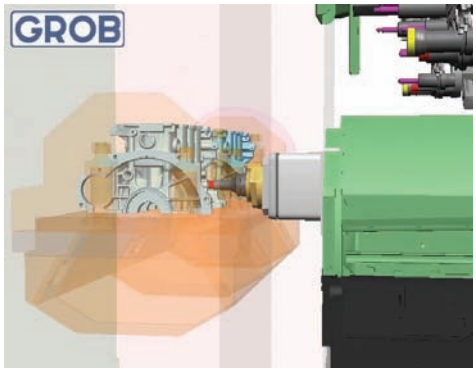
Machining Line Planner

Features *continued*
- Simulation and verification of individual machining processes and entire machining line
- Collision detection
- Material removal simulation
- Automated documentation



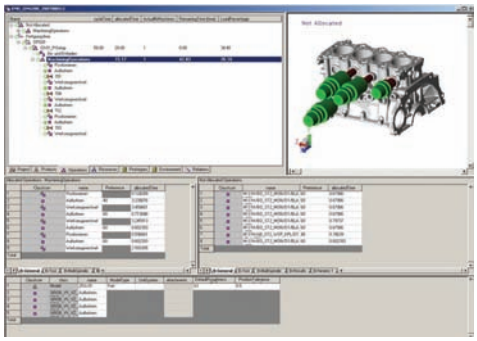
Simulation of GROB machining center using Machining Line Planner.

machines, holders, adapters, cutters, inserts, tool assemblies, tool sets, fixturing tools, materials, machining parameters and tool-path motions necessary to manufacturing each feature.

Cycle times for operations are calculated based on the NC tool paths and the machine tool characteristics.

Simulating machining operations
You can perform a full 3D machine kinematic simulation of the NC path that includes collision detection, material removal analysis and cycle time optimization. Collision analysis covers the machine, part, clamping fixtures and cutting tools. Machining operation simulation helps you reduce startup time for complex machining processes.

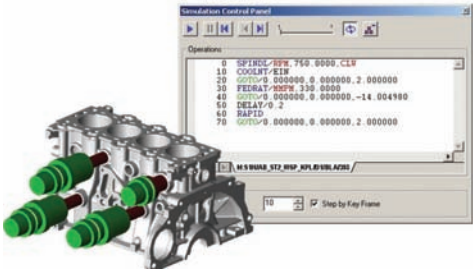
Defining the line
Machining Line Planner's line balancing capability automatically allocates operations to the lineup of machines according to each machine's tool specifications and available clamping conditions. Line balancing takes all relevant technical constraints into account to minimize nonmachining time, thereby avoiding tool changes, table rotations and tool travel as much as possible.



Machining operations are distributed according to the available clamping conditions on the machines.

Machining Line Planner also enables you to define parallel (multi-spindle) operations. Multi-spindle planning allocates single-spindle operations into multi-spindle resources, taking the maximum number of spindles into account, as well as maximum force and power, the minimum spindle distances and consistency of the machining strategies.

Simulating and optimizing the line
You can combine Machining Line Planner with Tecnomatix' Plant Simulation application to simulate and analyze the dynamic behavior and throughput of the machining line and balance its performance. Aspects like work-in-process, buffer sizes, resource utilization, mean-time-between-failure and mean-time-to-repair can be addressed.



Individual machining operations can be reviewed and simulated immediately after being generated.

Documenting machine design and its processes
Machining Line Planner can document a completely detailed process plan. Process documentation includes reports, such as process charts, time studies, work instructions and hole charts that can be exported in digital or paper formats.

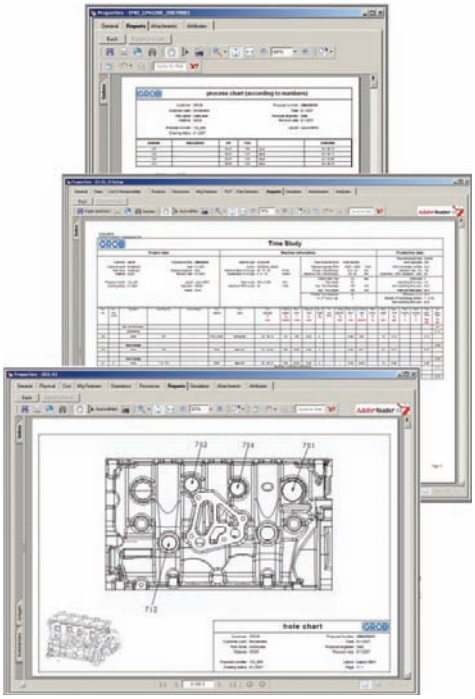
Manufacturing variants
You can define and manage planning processes for multiple (similar) product variants that share the same machining features. This enables you to easily balance a machining line for a mix of products.

Supported CAD data formats
Machining Line Planner supports the following CAD data formats:

- NX™
- Solid Edge®
- Catia v4 and v5
- Pro/Engineer
- JT™
- STEP
- IGES
- ACIS
- Parasolid®

Machining Line Planner modules
Machining Line Planner includes the following modules.

- NC programming
- Variants
- Parallel operations
- Methods editor
- Interface options
- Machining line design
- Machining feature definition
- Machining performance analyzer
- Machining RealNC



Example process documentation includes hole charts, time studies and process charts.

Contact
Siemens PLM Software
Americas 800 498 5351
Europe 44 (0) 1276 702000
Asia-Pacific 852 2230 3333

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