



SIEMENS



Take-off with increased productivity

Siemens Industry for Aerospace

Answers for the aerospace industry



The aerospace industry is challenged to build more aircraft with shorter time to market. The new planes will be lighter, faster and more efficient.

These aircrafts of the future drive new demands on product design, production planning, engineering and execution as well as service.



The modern aerospace industry is driven by four main factors:

Production Demand

A huge backlog of orders has to be cleared with limited resources and manufacturing capacities. Consequently, production rates have to be increased by both extending capacities and by improving processes in every phase from design, engineering, production, and services.

Technologies and material

The use of new material, especially composites, requires novel technologies not only in production facilities but also regarding the design and logistics in development and maintenance. Additionally, classical technologies such as riveting are being partly replaced by other technologies or undergo major changes from classical machine tool design to set-ups that are increasingly using robot technology.

Globalization

Aircraft manufacturers need to organize product development and manufacturing throughout different locations worldwide, with offsets and resource issues driving outsourcing to emerging markets. Product development has to be synchronized with manufacturing at an early stage on a global scale, and the supply of components and subassemblies managed in a timely manner.

Complexity

The complexity of aircraft and the associated volume of data during the whole product life cycle are dramatically increasing. Consequently, manufacturing equipment has to be more flexible, accurate and deliver greater performance. Plus, the handling of processes including workflow management and coordination of the different process steps becomes ever more complex.

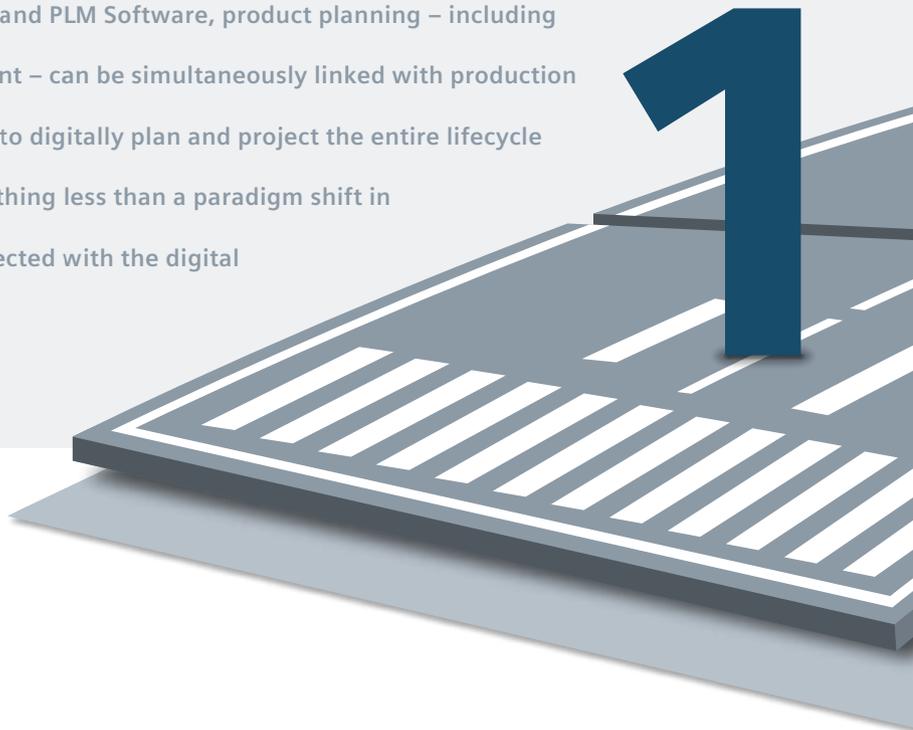


Reliable partners

As a system provider of automation solutions for production plants and machine tools, the Siemens MDB Aerospace supports the aerospace industry through all phases of their product and production lifecycle. We pool the industry and market expertise of aerospace experts with a broad technology and services portfolio. We collaborate with leading machine and systems engineering companies as well as the aerospace industry itself to create solutions designed to address these challenges by accelerating product design, plant design, automation design and production.

A seamless approach: our portfolio for aerospace

Production rate increase requires standardization and harmonization of processes. For this, software development and engineering communicate with production through a common platform. By combining Automation System Engineering and PLM Software, product planning – including technical requirements, design and development – can be simultaneously linked with production and corrective maintenance. Now it is possible to digitally plan and project the entire lifecycle of products and production facilities. This is nothing less than a paradigm shift in industry: the real manufacturing world is connected with the digital manufacturing world.



1 Product design

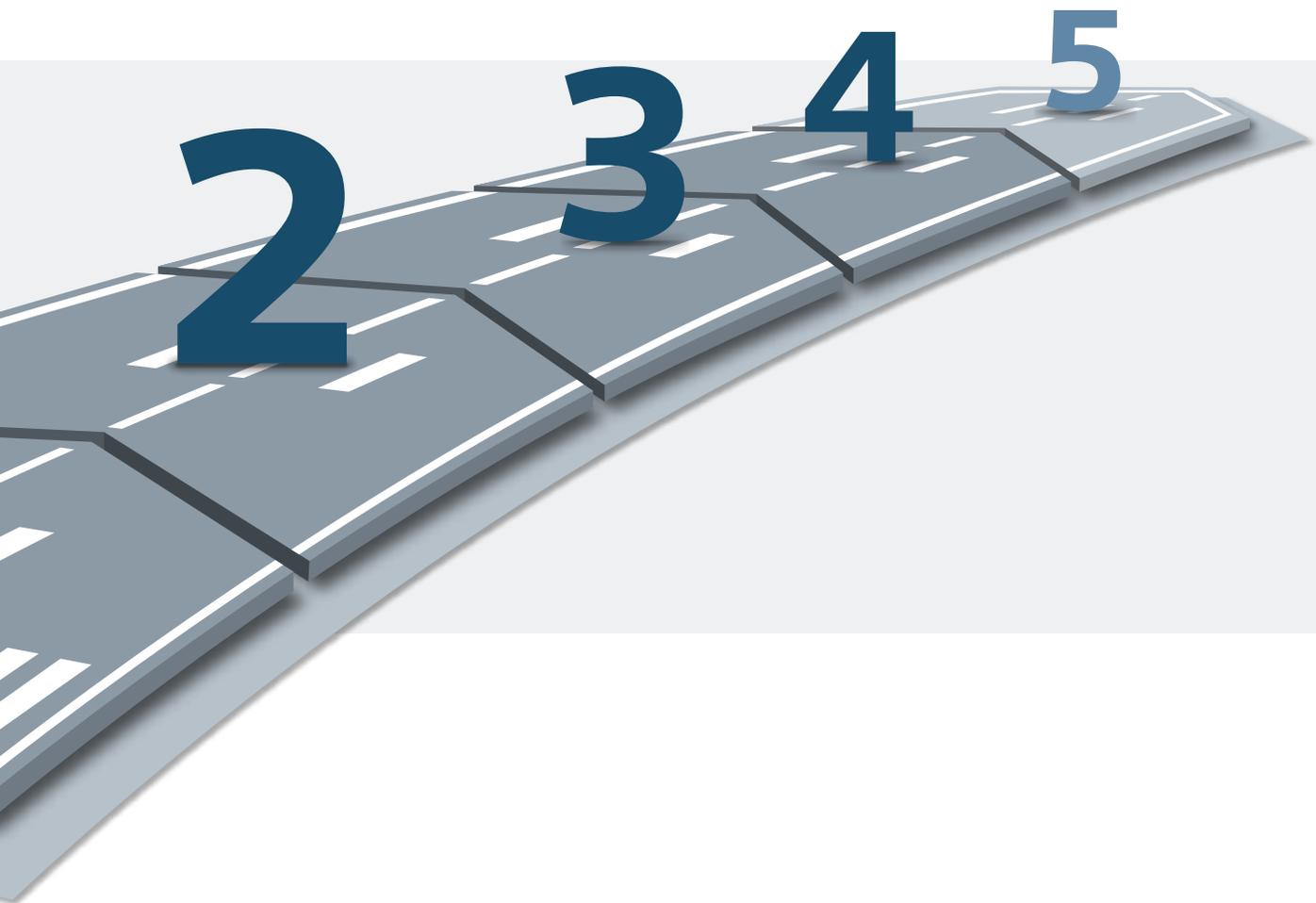
- Virtual development, planning and optimization with PLM software
- Dramatic reduction of development times with virtual prototypes
- Resource efficiency through virtual analysis of alternative designs

2 Production planning

- Integration of PLM software and automation technology
- Complete simulation and optimization of production
- Savings in terms of time, resources and energy costs
- Up to 50% faster time to market

3 Production engineering

- Seamless communication between the individual systems
- Integrated, uniform access to all automation tasks
- Optimized operational, machine and process workflows

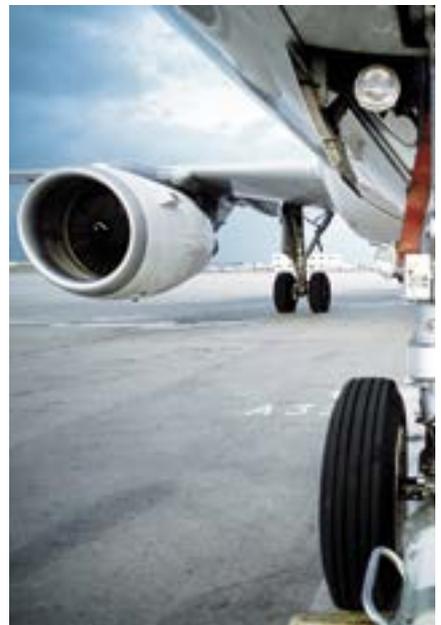


4 Production execution

- Increased plant productivity and efficiency thanks to integrated automation and drive system
- Openness, flexibility and high performance
- Intelligent data linking
- Transparent control of production processes

5 Service

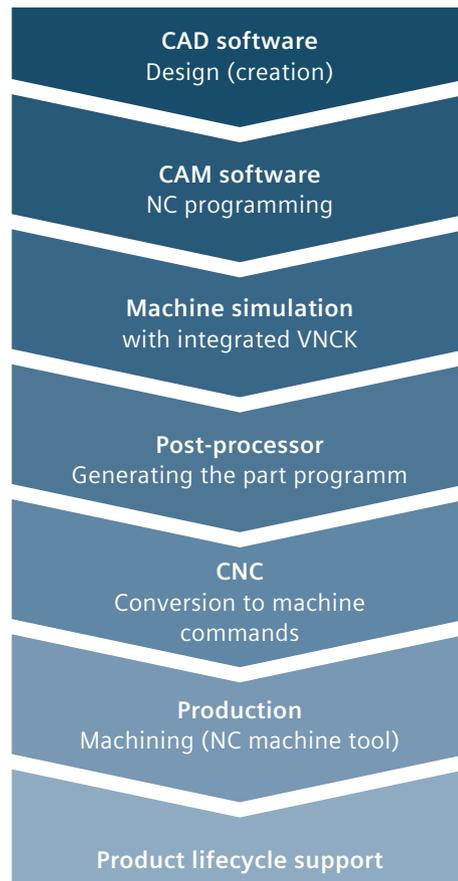
- Product-, system- and application-related services through the entire lifecycle based on vertical market and process know-how
- Less downtime and use of resources
- Higher productivity and efficiency combined with lower overall costs



From product design to production engineering from a single source

As a long-established supplier of equipment to machine manufacturers and users, Siemens is an integral link to the process chain in the aerospace industry and more than just a manufacturer and product supplier. We are actively involved in continuously improving the process chain to provide added value and benefits to the aerospace industry. Our activities cover everything from the design of components on a CAD system to program/data processing via CAM and postprocessor to machining on the CNC machines.

Many companies in aerospace manufacturing pursue improvement initiatives targeting activities that are often a heritage of paper-based processes. This requires integration and collaboration, an approach that also covers the growing need to provide engineering information for through-life support. An efficient data exchange and data integrity must be maintained across the applications and systems that create, manage and use engineering data. Our set of integrated systems and solutions provides the necessary IT integration both horizontally across units and facilities and vertically from the manufacturing level to operation and monitoring as well as supporting manufacturing execution system and enterprise resource planning.





Product design

Our production-proven product lifecycle management (PLM) software customizes the CAD system to meet the specific needs of the aerospace engineer and allows better decisions earlier in the process. Our PLM software offers the first truly complete aerostructures development solution, enabling a seamless workflow that spans analysis, design, manufacturing, assembly and quality planning. The result is a high-performance aircraft delivered on time and on budget.

Production planning

By integrating PLM software and automation technology, our solutions for production planning enable a seamless transition from product design into the manufacturing phase of the product lifecycle. Our digital manufacturing applications provide tailor-made applications for manufacturing users in the aerospace industry, supporting the complete simulation and optimization of production. This yields savings in terms of time, resources and energy costs, and speeds up time to market by up to 50%.

Production engineering

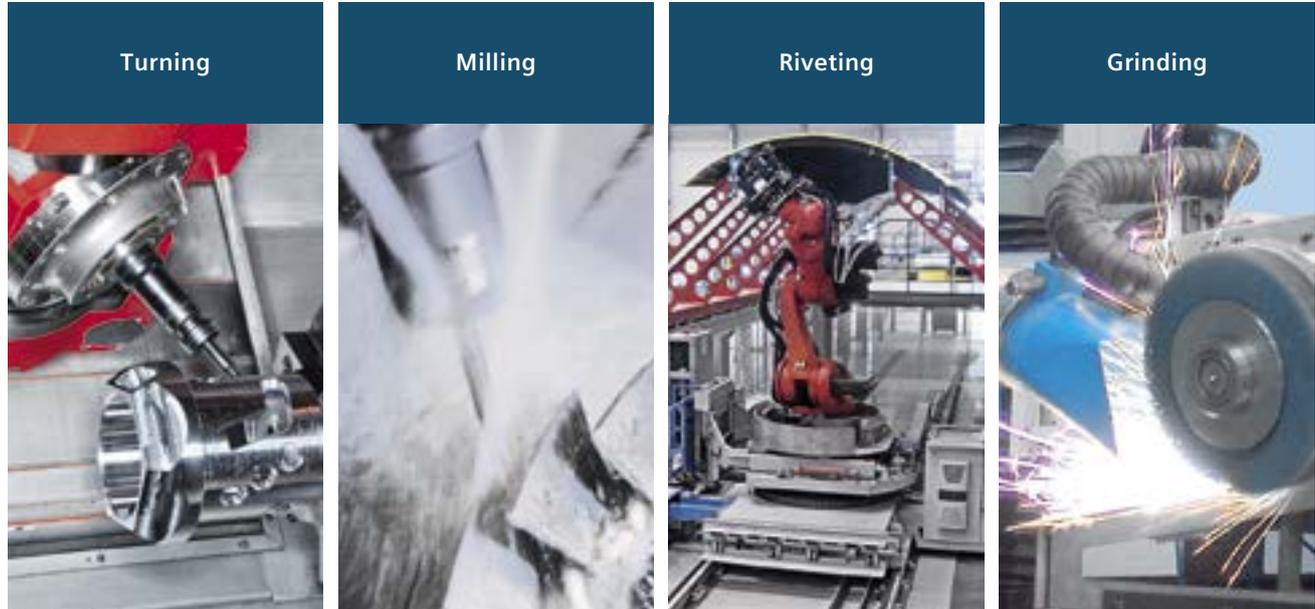
Our PLM software solutions for aerospace facilitate unprecedented production productivity. They integrate operational planning and process optimization with advanced five-axis machining and link supply chain synchronization with final assembly and acceptance testing. They also ensure seamless communication between the individual

systems and integrated, uniform access to all automation tasks. Our solutions enable companies to link critical manufacturing operations (including suppliers, final assembly and acceptance testing sites) in a single bill of material (BOM) with an engineering-oriented product structure and process workflows. Thus, the aerospace industry benefits from a synchronized manufacturing process, lowering both its fixed and variable total cost and building the right product from the first time onward.

Product lifecycle support

In addition we offer through-life product support for complex aerospace platforms and systems that must be maintained and supported for 30 to 50 years. The PLM suite maintains a comprehensive and current record of the technical definition of every system and serialized part, enables the rapid implementation of systems upgrades and enhancements, and ensures alignment of all changes with the latest requirements. We also ensure all technical service and training documentation is compliant with the latest requirements which can change dramatically over such protracted lifecycles. The collective impact of PLM software solutions for product lifecycle support is greater platform availability and reliability and lower support cost for the owner or operator.

Production execution with top level CNC aerospace machining



Modular, flexible, reliable and open: Our high-end CNC supports all relevant technologies in the aerospace industry. This state-of-the-art aerospace CNC will boost your production by guaranteeing increased safety during production, increased productivity thanks to faster production, shorter machine setup and downtime, and an optimized production flow. New uniform and creative machine concepts and integrated CAD/CAM-CNC process chain also allow for further technological advancements.

Modular at all levels

The SINUMERIK 840D sl is a flexible CNC platform to continuously increase productivity. This is achieved with just a few modules that always fit together.

- A large selection of operating components for comfortable operation, monitoring and programming.
- Various Process Control Units (PCU) are available for customized HMI performance, connectivity and expandability.
- Powerful Numerical Control Units (NCU) scalable in performance and number of axes.
- The flexible SINAMICS converter system makes it easy to combine individual drives to a drive unit.
- With SIMOTICS, Siemens offers a comprehensive range of electric motors that is harmonized with the frequency converters.

Scalable in performance and number of axes

SINUMERIK 840D sl provides various machine tools with the optimum CNC performance. To achieve this, it is available in several performance versions. Up to three NCU730, coupled through the NCU Link, provide the highest performance available. They can control up to 93 axes in up to 10 machining channels.

High standstill torques, high maximum speeds and smooth-running characteristics make SIMOTICS servomotors the ideal feed drive for machine tools. Going beyond the conventional rotary motor principles, the SIMOTICS range of motors encompasses dynamic linear and torque motors, too. With SIMOTICS T-1FW6 torque motors, completely new machining technologies can be addressed, such as multitasking. The long tradition in building electric motors is supplemented by a wide range of spindle solutions.

Composites machining



Handling and robotic CNC machining



Nibbling, laser beam and water jet cutting, plasma machining



Multitasking



Totally integrated

The SINAMICS converter range, together with the SIMATIC S7 automation system and the SINUMERIK 840D sl form a perfectly coordinated control system for:

- optimal utilization of the spindle power,
- protection against overload,
- protection of the work piece,
- shorter machining times, and
- higher surface quality.

Additionally, the Safety Integrated standard safety functions protect people and machines.

Comprehensive functions

The basic configuration already contains an abundance of functions for drilling, turning, milling and grinding. Special technology functions such as those for laser machining are available as directly reloadable compile cycles. To boost productivity SINUMERIK can also offer easy integration of robots for loading and unloading. The Run MyRobot technology package enables dynamic workpiece and tool handling. Interactions such as operation, retraction, teach-in and diagnostics can be implemented using the SINUMERIK 840D sl via the CNC operator panel and increase the efficiency and flexibility of the machine tool.

Open for customized solutions

With system openness that is unique in the market, the SINUMERIK 840D sl optimally fits the machine technology, ultimately creating that all-decisive productivity increase. As a result of the SINUMERIK 840D sl's system openness, SINUMERIK Solution Partners can expand the CNC to include a wide range of additional solutions, products and services.

- The open world of SINUMERIK is entered via standard systems with broad NC functionality, engineered at NC language level. The PLC can be adapted to individual needs via standard SIMATIC engineering tools.
- Possibility to supplement the SINUMERIK applications with additional ones from third-party suppliers, such as tool and process monitoring systems, measurement systems, as well as teleservice and video monitoring systems.
- SINUMERIK 840D sl allows work pieces to be simply programmed in Cartesian coordinates and required machine axis movements to be calculated automatically through its system-specific cycles and function macros.

www.siemens.com/sinumerik

Totally Integrated Automation – systematic value added for aerospace

Final assembly



Tilt and turn units



Pulse motion line



To achieve increased plant productivity and efficiency, the aerospace industry has to exploit the benefits of integrated automation solutions. Totally Integrated Automation (TIA) provides numerous benefits throughout the whole production lifecycle. These are based on innovative products originating from a consistent automation portfolio and clearly defined system features enabling maximum production performance and response, intelligent data linking, and transparent control of production processes.

Standards for productivity and competitive strength

With TIA, you are setting standards in productivity and maintaining your competitive edge. The comprehensive product and system portfolio ensures totally integrated automation from the production line to the production management level through the corporate management level. The result: shorter time to market and significantly reduced lifecycle costs.

The standardized controller system allows you to conveniently integrate all machine and system components in an existing multi-vendor environment. The uniform bus system ensures data transmission during all production processes. Furthermore, open software system interfaces ensure that the process data are shared. The engineering platform TIA Portal supports you in all configuration tasks: from development to assembly and commissioning through to maintenance and the extension of automation systems, reducing engineering time, costs and effort. These effects are realized through intuitive user interfaces, centralized data storage and proven technology.

Thermal forming



Autoclaves



Automated guided vehicles



Higher production flexibility

With the SIMATIC automation system you can react in real time to changed market requirements and adjust your production processes accordingly, without requiring large expenditure. This flexibility ensures reduced innovation cycles and allows to control all product changes quickly from a central location. With reliable and rugged components, comprehensive diagnostic options and integrated safety we will help you reduce downtimes and minimize faults.

From innovation to standard

In the aerospace industry, continuous innovation is the key to success. With our comprehensive portfolio for automation and drive systems, the aerospace industry can proactively meet today's requirements – for example, improved productivity, optimized operational and production costs, industrialization of the new material production processes, and mastering increasing complexity.

High availability: the key to quality

The aerospace industry is characterized both by intensive research and development and a high quality claim set forth in production. Manufacturing quality mainly depends on a smooth interaction of all automation components. The automation solution provides the basis for highly reliable and available machines and systems, thus contributing significantly to sustainably optimizing your overall productivity.

Energy management: more than a technical system

Energy-efficient production means reducing energy consumption without affecting the productivity of the systems and devices used. Technical systems for the acquisition, analysis, documentation and visualization of energy data as well as the regulation and control of your energy consumption help to efficiently and sustainably reduce your energy costs. We support you in the systematic and continuous monitoring, analysis and improvement of your energy consumption.

World-class manufacturing process and services for the global aerospace industry



SIMATIC IT Aerospace & Complex Manufacturing

SIMATIC IT, our Manufacturing Execution System, is designed to standardize production across the entire enterprise, integrate the control and business systems in factory and keep manufacturing processes aligned with supply chain activities.

The vertical solution provides specialized MES features for the manufacturing processes:

- Work-in-Progress management, Electronic Work Instruction and worker guidance, paperless factory
- Integrated quality management, including visual inspection, non-conformance detection, defect management and analysis
- A modeling approach with automated workflows to easily adopt new production methodologies and process improvements
- Shop-floor connectivity for harmonized data acquisition and machine control
- The ability to manage engineering data originating from the PLM system for a seamless transition from the design phase to production through engineering
- ERP interoperability for master data synchronization, real-time production order and operations monitoring
- Reports and data warehousing for genealogy, process control, KPIs and trends

www.siemens.com/mes

SINUMERIK Integrate

SINUMERIK Integrate perfectly integrates SINUMERIK controls into the IT environment of modern plants. This is achieved using a powerful software suite for managing programs and tools, analyzing machine data for maintenance, visualization and diagnostics as well as interfacing.

- NC programs are organized and managed throughout the network
- Tools are managed throughout the network
- Machine states are evaluated for condition-oriented maintenance
- Machine data and operating states are acquired and visualized throughout the factory
- Remote diagnostics, from peer to peer via LAN
- Interface to back up and assign versions to CNC data
- Communication interfaces to connect to master computer applications

www.siemens.com/sinumerik-integrate

Basic services –

Field service and technical support (hotline)

As a global company, Siemens Industry provides fast and competent service, repair, inspection and maintenance around the world. Furthermore, our competent hotline experts answer all questions related to our aerospace solutions.



Image source: MTU Aero Engines

Integral Plant Maintenance

Modern industrial plants should be available at any time and run with highest efficiency. Reliability and productivity should be ensured in a sustainable way. Integral Plant Maintenance increases productivity and competitiveness with a perfectly balanced service portfolio:

- **Consulting**

Implementation-oriented maintenance consulting and benchmarking, coaching for the implementation of improvement measures.

- **Plant Maintenance Services**

Tailored technical services: maintenance, repair, inspection, and condition-based maintenance for systems and subsystems.

- **Outsourcing**

Complete maintenance of production plants and facilities through performance contracts based on KPIs such as availability, safety and costs.

Enhancing your competitive edge

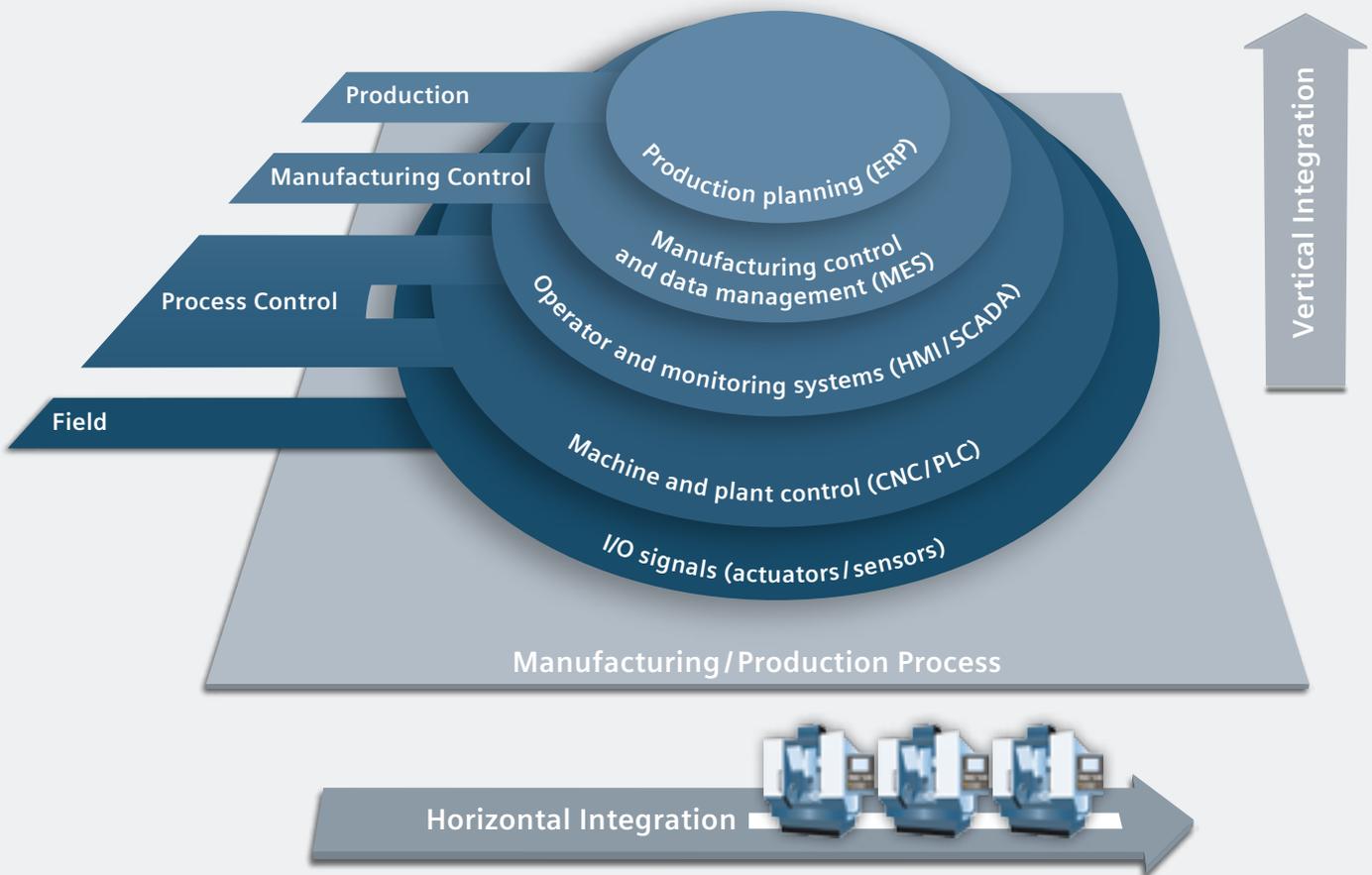
Deep within your manufacturing plant lies hidden performance potential – locked away in the complex interaction of production assets and processes. Based on industry-specific competence and technical expertise, Siemens Industry Services maximize your equipment uptime and increase your plant's efficiency.

Siemens was chosen by renowned aero engines manufacturers to perform their plant maintenance. The agreement covers machine tools, production and processing systems, and associated equipment. 70 highly qualified Siemens employees deliver mechanical and electrical maintenance services in two- and three-shift operation. Additionally, Siemens is responsible for the maintenance and spare parts management. The company benefits from guaranteed flexibility and fast responses to production fluctuations as well as from cost certainty thanks to defined maintenance budgets and KPIs.

www.siemens.com/success-story-mtu

Transparency in production

With its unique portfolio, Siemens is more than well positioned to provide complete solutions to the challenges faced by the aerospace industry. An aligned set of automation and drives solutions and industry software integrates all processes along the entire manufacturing value chain – from goods receiving to shipping, from the enterprise resource planning down to the sensors and actuators at manufacturing level. This comprehensive offering is complemented by our in-depth industry knowledge that we share and build in our daily business with system integrators, OEMs, and aerospace companies. Benefit from expertise and technology that connects processes and people.





Being able to rely on your equipment and increasing your production rate at the same time is one of the biggest assets in aircraft manufacturing. To achieve this, an integrated automation system is the perfect platform in a manufacturing environment. We offer a broad portfolio of high-performance products and systems that can be well integrated even into a heterogeneous production. We work together with aerospace industry leaders and their supply chain, with their machine suppliers, and with expert system integrators. This approach provides for the highest manufacturing efficiency.

These are just some of the benefits you can expect from Siemens as an established global player in the aerospace market:

- Aerospace expertise you rely on
- Automation technology to increase your production rate
- Transparency in production to identify your bottlenecks
- Standardization to reduce your asset costs (spare parts, training)

Everything you need to know about SINUMERIK CNC equipment:
www.siemens.com/sinumerik

Everything about Siemens Industry for aerospace on the web:
www.siemens.com/aerospace

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