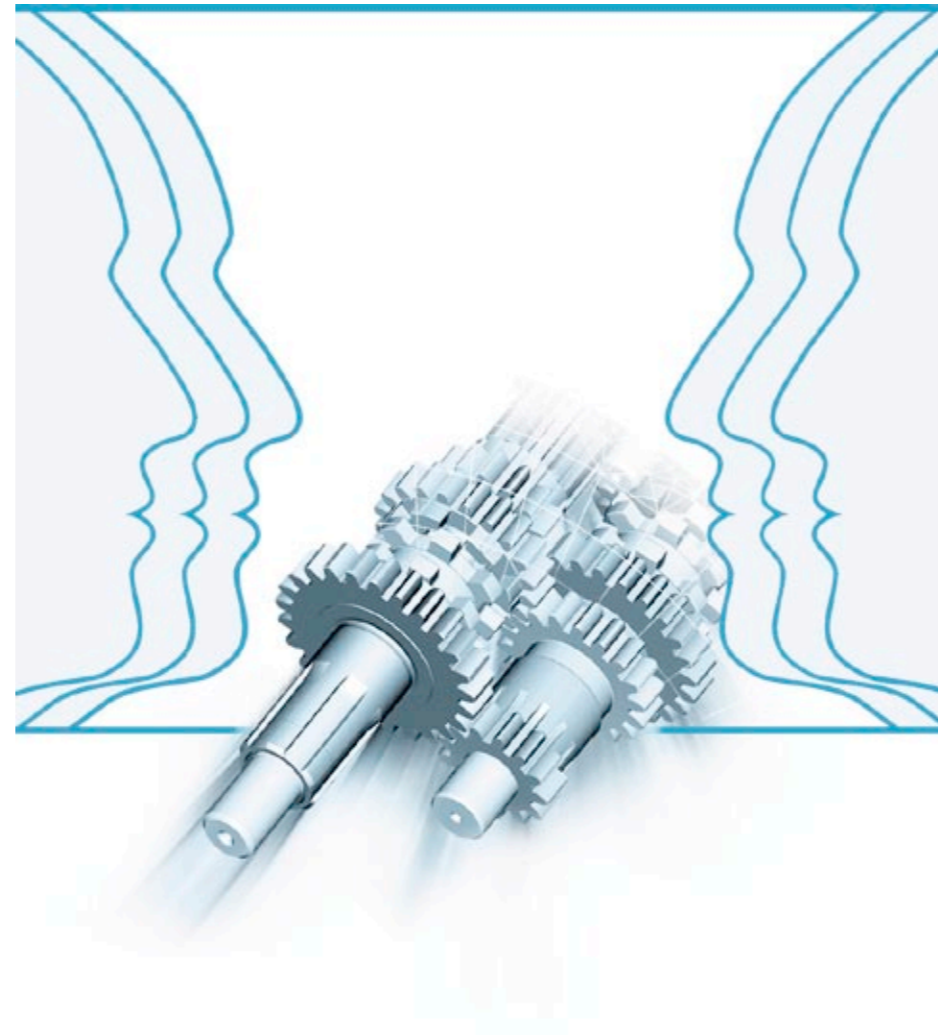


Roschiwal + Partner

Engineering



10 Corporate Goals for the Benefit of our Customers

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Welcome to Augsburg and Berlin

The Beginning

Our company was founded by Helmut Roschiwal in Augsburg, Germany on January 1st, 1984.

Production Engineering Manufacturing Engineering Assembly Engineering

Thanks to the confidence, our innovative customers have in our work, and a wide variety of orders in the fields of production engineering, manufacturing engineering and assembly engineering, we have been able to achieve a high level of theoretical knowledge and extremely sound practical experience. Cutting-edge customers with high expectations for externally contracted development work have also aided in our own development.

Three Locations

Encouraged by the number of incoming orders, we expanded as early as 1985 with the founding of Roschiwal + Partner Ingenieur GmbH Berlin.

Globalization and the eastward expansion of the EU were motivations to found a subsidiary in Timisoara, Romania as well.

100 Engineers for R+D

Our success as a service provider is closely linked to the technological and economic success of our innovative customers, as well as to the commitment of our more than 100 highly-motivated engineers.

Technological Competition

Tough technological and economic competition means that industry has to invest even more than ever in new product development: requested are new solutions and short development times.

The Goal

For this reason, our corporate goal is to provide our experience to support our clients' profoundness and to significantly increase their speed of innovation.

I invite you to get to know us better over the following pages, and I would be especially glad to welcome you personally at our company.

Respectfully yours,



Konrad Popp
Managing Partner
Augsburg



Product Development and Engineering to Customer Specifications

1

R+D at a Fixed Price

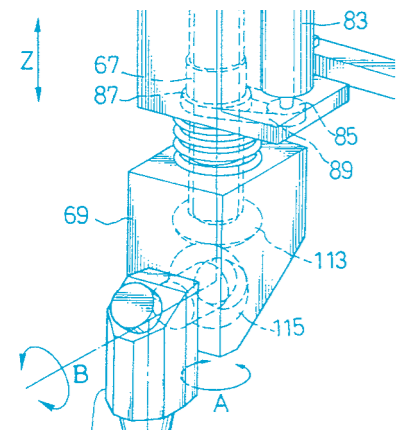
Realization of development orders at our firm guarantees you access to an experienced development team – at a fixed price and with a fixed delivery date.

Depth and Breadth of Knowledge

Our work is based on the customer's experience and depth of knowledge. We contribute a breadth of knowledge and design engineering experience in various product areas. Combining customer's depth of knowledge with our experience often result in innovative and cost-optimized solutions.

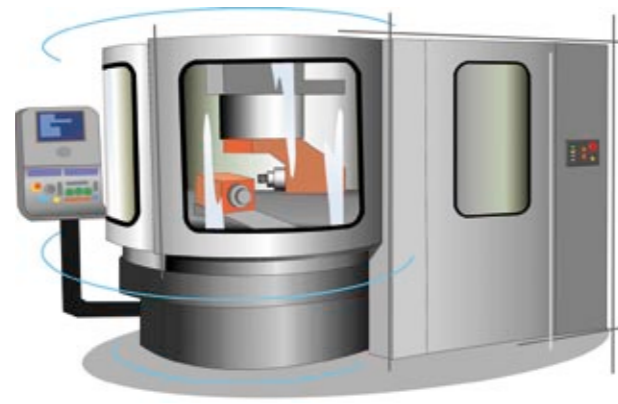
Integrated Development and Design Engineering Work

The choice is yours: From the initial concepts to the delivery of all manufacturing documents, we cover the entire development process for you. Or you may choose any desired individual modules.



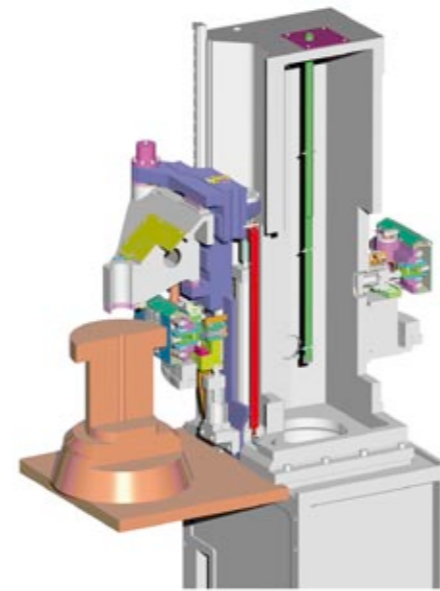
Initial Ideas

We apply methods for creating ideas, such as brainstorming, TRIZ, morphological boxes, etc. during the entire development process, but especially in the initial phase. One major benefit that is appreciated by our customers is our breadth of knowledge and the resulting opportunities to apply solutions from related technical fields – or even from entirely different ones. Taken together, these approaches lead to innovative products, which are often also patentable.



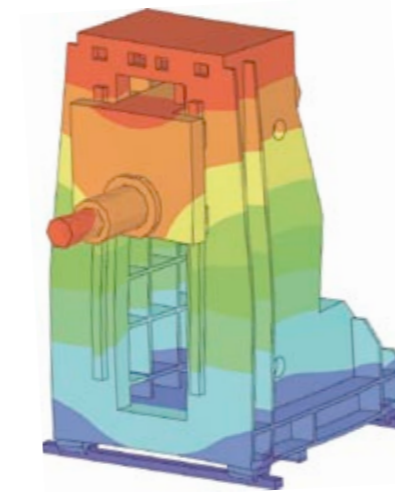
Concepts

During concept phase, our task is to present you, our customer, with a number of alternative solutions within a reasonable period of time. This is accompanied by an evaluation from a technological and cost standpoint. Our engineering service "Evaluation of engineering designs" has proven its worth here (see page 13).



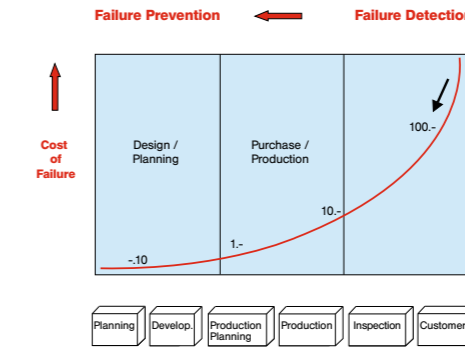
Design Engineering and Detailing

Together with our customer, we evaluate the various concepts and determine the optimal solution. The design drafts, all part drawings, assembly drawings and bills of materials are created on the same CAD system as yours and are 100% compatible with your in-house system. The documentation is executed in accordance with your company standards or common industry practices. Purchased parts follow technical and commercial criteria and are selected in close consultation with our customers.



Calculations during the design engineering process

After the preliminary estimates, more detailed calculations are made, e.g. for drives and machine elements; these are updated as the design progresses. FEM analysis are made to evaluate the different variants and to design and optimize the components. Our customers benefit from the fact that these analyses are made exclusively by experienced design engineers who have the necessary expertise to interpret trends and to make suggestions for optimization. For more detailed information, please consult our engineering service "FEM to customer specifications" (see page 13).



Manufacturing Costs + Quality

The objective of the entire design engineering process is to achieve the manufacturing costs agreed in the performance specifications, or lower them even further. Constant verification is carried out by means of cost calculations which accompany each phase of the R+D. Preventive quality measures using FMEA has proved particularly useful for high-volume products. Please consult our engineering service "FMEA" for more detailed information (see page 13).



Prototypes

On customer request, we also supply prototypes, special equipment or test installations as a complement to our services. We do this with qualified cooperation partners.

The Customer's Depth of Know-how

Together we Achieve Innovative Solutions!

Production Machines

Our experience in production engineering comes from the development of standard-production machine tools for well-known machine tool manufacturers.

Product Development

Product development encompasses automotive industry products, capital goods, mechatronic assemblies, and much more. Both technical departments stimulate each other – for the benefit of our customers.

Our machine tool customers appreciate the cost consciousness that we have learned in the automotive field, and car manufacturers profit from our broad knowledge of production, manufacturing and assembly engineering.

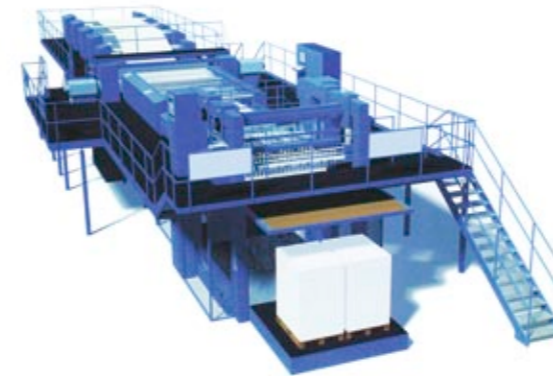


CNC-Machine Tools

The core competency of our business is broad know-how in the field of production engineering. It results from our experience in a large number of development projects for machine tools:

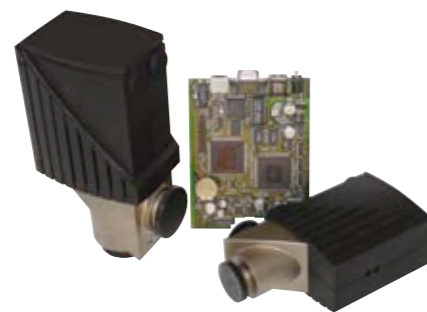
Bandsaw centers, belt grinding centers, sheet metal bending centers, CNC machining centers, CNC lathes, surface grinding and cylindrical grinding machines, high-speed milling machines, cold rolling machines, crankshaft grinding machines, cam grinding centers, punch press, gantry-type milling machines, rotary transfer machines, worm milling machines, worm grinding machines, EDM and wire EDM machines, centerless grinding machines, deep-hole drilling machines, gear hobbing machines, gear shaping machines, tool grinding centers, whirling machines, vortex grinding machines, gear grinding machines;

Dresser units, tool-chain magazines, tool-disc magazines, manipulators, machine housings, transfer equipment, pallet changers, cantilever tool magazines, rotary tables, quick-change systems, workpiece-changer, industrial robots, handling systems



Special Machines

Aerospace: equipment for engines, for Airbus hatches and doors, swivel drives in aircraft construction, riveting and assembly fixtures, research telescopes, wood-fiber-plastics
Process-Technology: throughfeed presses, injection molding machines, spreader system for particle boards, thermal forming systems
Paper and foil processing: calendar binding machines, manipulators for wrapping machines, roll-cutting and wrapping machines, stacking machines, coaters, corrugated board machines, turret winders
Cutting and welding systems: fillet welding systems, laser cutting and welding machines
Metal-Forming-Technology: bending machines, sheet metal working centers, eccentric presses, hydraulic presses, a hydroforming machine, toggle lever presses, a tube bending machine, screw presses



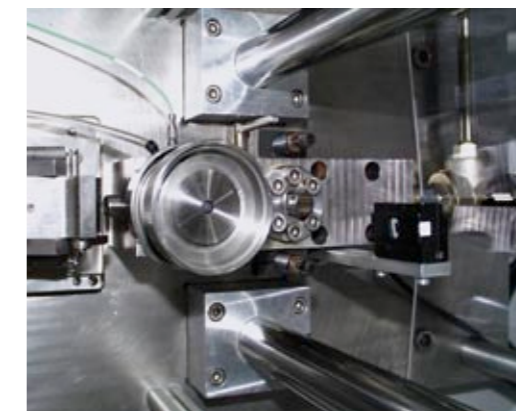
Automotive and Mechatronics

In the automotive industry, high production quantities and the extraordinary pressure to reduce costs mean that the design engineering process is subject to a unique set of rules, e.g. the cost of materials plays a dominant role compared with the capital investment in production facilities. Safety considerations and preventive quality measures are of crucial importance.



Capital Goods and Mechatronics

For the development of capital goods in the medium production quantity range, e.g. pumps, vacuum pumps, pneumatic cylinders, and power tools our experience in implementation of a wide variety of production machines provides a significant advantage.



Assembly and Test Stand Technology

In the field of assembly and test stand engineering we create assembly concepts, design assembly lines, and optimize assembly processes with regard to costs and performance.
Automotive: transmission assembly, transmission test stands, steering system test stands, engine block installation, oil pan installation, wheel bearing installation, tire test stands, rack-and-pinion steering assembly
Aircraft Industry: Airbus cable harness installation, Airbus door installation, cargo loading systems



Optimization of Manufacturing Processes

The optimization of manufacturing processes, determination of the optimal machinery for each individual production step, and communication of these steps to the controller manufacturer round out the scope of our services.

Engineering Services: Applied in a Project, or as Consulting Package

Besides development and design engineering of high-technology products, we can also provide you with various engineering services to increase the quality of your products – either to accompany an ongoing project, or as a stand-alone service.

Following are descriptions of the engineering services that are currently most in demand by our customers. A summary of all available engineering services is located at the end of next page. Please use the IL-N^o indicated to request more detailed information about the particular engineering service.

Cost Reduction

Capital goods that are produced over a number of years are generally improved repeatedly, but nevertheless suffer from excessively high manufacturing costs. A possible solution is to carry out a redesign that pays particular attention to the manufacturing costs.

The method we have developed is a systematic cost optimization procedure especially for capital goods, which employs the benefits of value analysis, ABC analysis and various creativity techniques, while staying within reasonable time and cost limits.

FEM: Finite Element Method

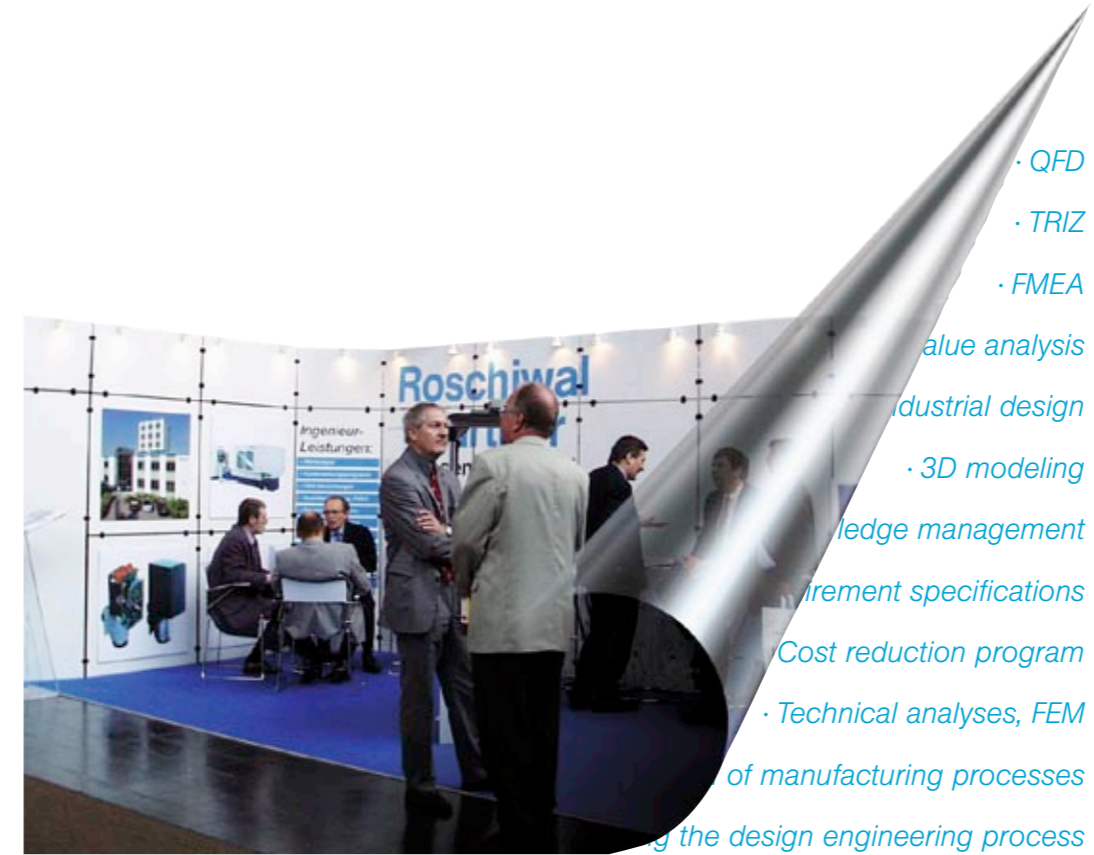
Technical analyses at a fixed price: from simple geometrical analyses to finite elements. FEM analyses in the run-up to a new development project can eliminate the need for prototypes or reduce the number of prototypes to a minimum.

Risk Analysis, FMEA

Failure Mode and Effects Analysis, is used to implement preventive quality measurements. Our program takes the experience of 14 industrial companies from various sectors, and helps the customer to avoid unnecessary assembly costs both by eliminating errors at an early stage and by avoiding errors during the development process.

3D Modeling of Multiple Applied Parts

According to a representative survey, after conversion from 2D to 3D CAD, about 20–40% of the components used duplicates, but are not yet available as 3D models. By creating 3D models of multiple applied parts in advance (for a low fixed price), development time can be shortened considerably.



- QFD
- TRIZ
- FMEA
- Value analysis
- Industrial design
- 3D modeling
- Knowledge management
- Requirement specifications
- Cost reduction program
- Technical analyses, FEM
- Optimization of manufacturing processes
- Optimization of the design engineering process

Optimization of Manufacturing Processes

Execution of integrated systems planning based on our experience in production, manufacturing and assembly engineering.

Value Analysis

The goal of classical value analysis is to detect cost factors for a product that contribute neither to quality, efficiency, durability, appearance nor sales advantage. In contrast to the cost reductions listed above, we use this method for products with high production quantities, e.g. in the automotive and home appliance industries. (For areas with smaller production quantities, for example production machines, please see our cost reduction program).

Engineering Services Currently Available

Cost reduction program	IL-KS 011
Finite Element Method	IL-FE 011
FMEA	IL-QM 011
3D modeling	IL-CD 011
Optimization of manufacturing processes	IL-QM 012
Value analysis	IL-KS 012
Virtual motion animation	IL-CD 012
QFD – Methods for product and quality planning	IL-QM 013
TRIZ – Creating ideas instead of waiting for a sudden inspiration	IL-RD 011
Knowledge management	IL-KM 011
Cost analysis during the design engineering process	IL-KS 013
Industrial design	IL-RD 012
CE certification	IL-QM 014
Reducing the cost of complexity	IL-KS 013
Phone- and videoconference	IL-KM 012
Simulation of structural features of a machine tool	IL-FE 012
Project management	IL-QM 015
Evaluation of engineering designs	IL-RD 013

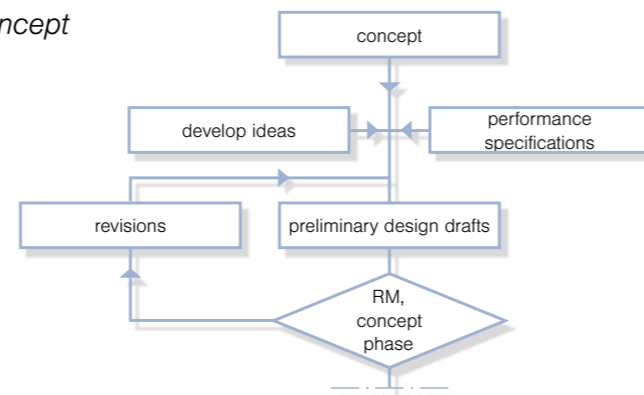
Target-orientated Project Planning: Your Time Savings

4

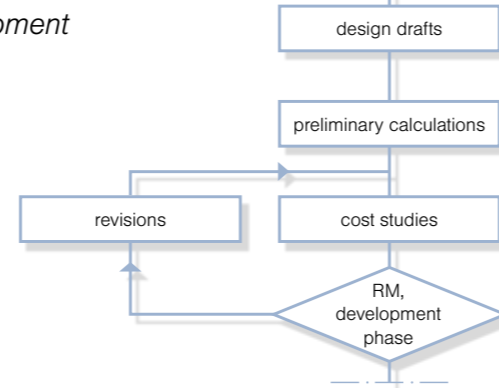
Step by Step To maximize the benefit to the customer, as a rule we carry out development and design engineering in three phases. In all phases we proceed in a methodical, step by step manner.

Review Meeting Coordination with the customer takes place in review meetings (=RM) held about every 14 days. This process ensures that the project will stay on track.

Phase I: Concept



Phase II: Development

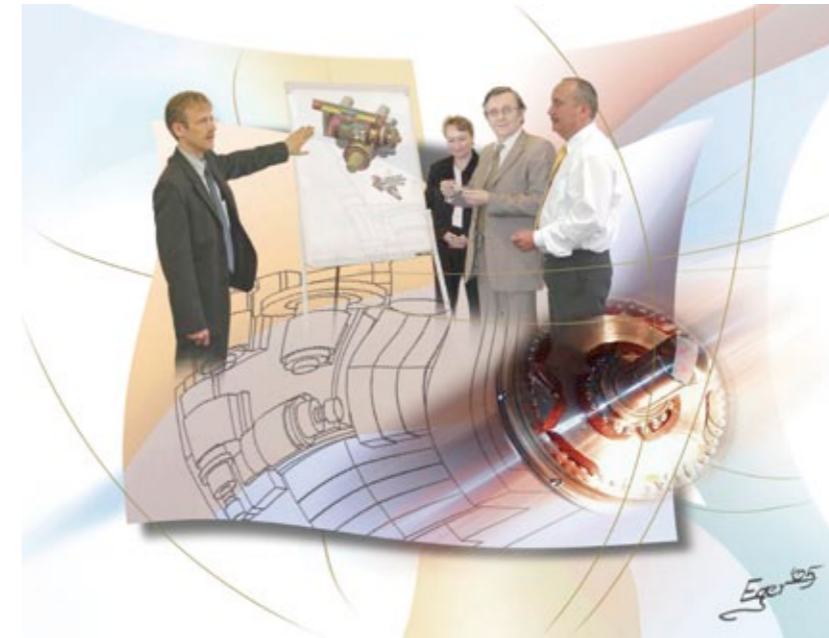


Performance Specifications/ Requirement Specifications

If a completely new product is involved, it may be advisable first to carry out a study of the market, resulting in a set of performance specifications/requirement specifications. It is useful to get us involved in the creation of the requirement specifications – that way our ideas and specialist knowledge can be put to good use even in the task definition stage, and we can also apply a critical analysis regarding feasibility. Project reliability can likewise be enhanced by means of a preliminary project study. This service is also provided for a fixed price and by a fixed date.

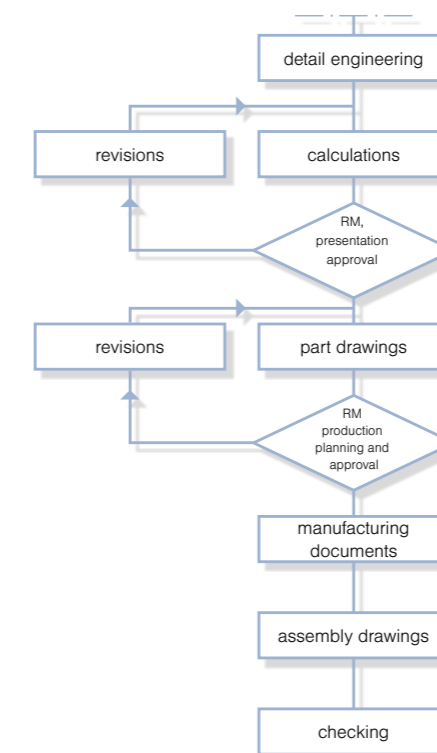
The pre-development phase is logically followed by the development and documentation phase.

Checking Before leaving Roschiwal + Partner, all drawings and production documents are subjected to a 100% dimensional and functional check.



The extra work involved for these checks is worth it for the customer: Manufacture can then proceed on-site without any additional support.

Phase III: Design/Engineering



100% Dimensional and
Functional Check

CAD: Compatible with your System

5

Absolute Compatibility

Technical drawings and 3D CAD models are the engineer's language, the interface between engineering and manufacturing, and the carrier of information during the entire production process. For cooperation to succeed, it is essential that we speak the same language as you, the customer, right down to dotting the last "i" and crossing the last "t". That means that not only our CAD system must be the same as yours, but also that the update, version and settings must be identical.

Data Security

When we use open transmission paths such as FTP and e-mail, confidential data (texts, drawings, layouts, etc.) are always compressed and encrypted.

For long-term cooperation we use a VPN. Various methods are available here: anything from the Microsoft VPN client and Cisco client to independent tunneled subnetworks, which can for all intents and purposes be seen as a virtual extension of the customer's network.

E-mails are checked already at the mail server, and any dangerous contents are blocked there.

The Internet connection is naturally protected with NAT, IP masquerading and independent firewall/proxy server. Only the ports which are absolutely necessary are open.

CAD-Systems used presently:

- AutoCAD
- Pro/ENGINEER
- HP-ME 10
- Unigraphics
- CATIA
- Solid-Edge
- Solid Works
- OSD
- Inventor
- I-DEAS

FEM: Accompany an Ongoing Project, or as a Stand-alone Service

6

FEM Analyses

FEM analyses in the run-up to a new development project often eliminate the need for prototypes or reduce the number of prototypes to a minimum.

The FEM program ANSYS is available for complex tasks.

This can be used to perform a wide variety of calculations, such as stiffness and strength calculations, dynamic calculations and thermal analyses. Very little work is required on the part of the customer: since we have so many different CAD systems, the geometry data can almost always be transferred directly.

Interpreting the Results

Another benefit for the customer:

Our CAD engineers have many years of design engineering experience, giving them the necessary expertise to interpret the results and carry out plausibility checks and evaluations.

Other Calculations

The following programs, among others, are available to the customer for approximate calculations and plausibility checks:

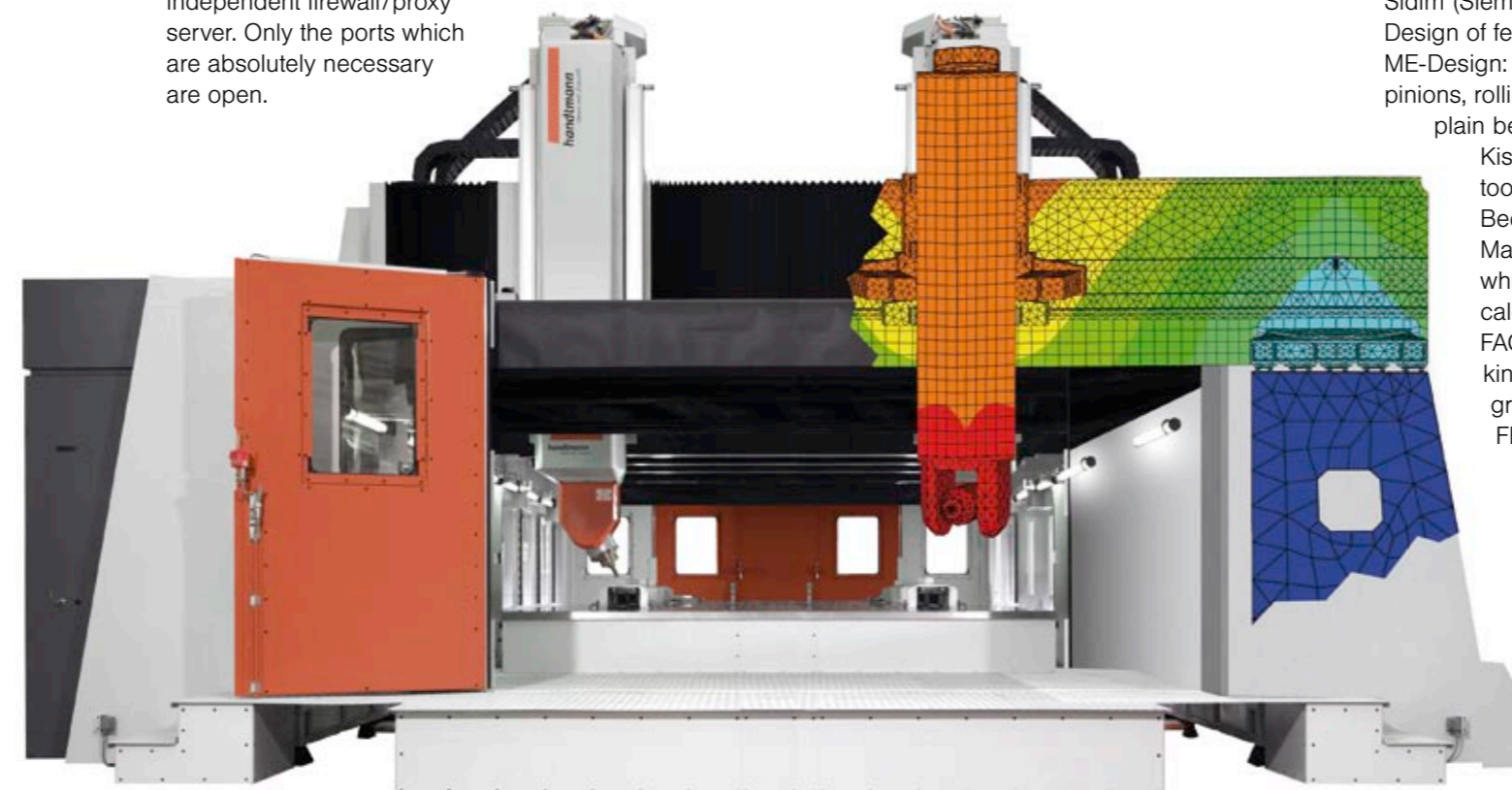
Kisssoft: spur and helical gears, bevel gears, racks and pinions, shafts, structural elements, rolling-contact bearings, plain bearings, belt drives, worm gears, hypoid gears, spline shaft connections, chain drives, screws, shaft-hub connections, bolts, pins, welded joints, springs
Sidim (Siemens) and Cymex (Alpha):
Design of feed drives
ME-Design: spur gears, bevel gears, racks and pinions, rolling-contact bearings, plain bearings, belt drives

Kisssoft: Complete gear units with toothings, shafts and bearings

Bechtel: spur gears inside and outside
Mathcad 7.0-2002: mathematical tool which is used to develop one's own calculation algorithms

FAG: design of rolling-contact bearings
kinematic simulation program integrated in Solid Works

FEM and kinematic simulations



Integrated Product Development from a Single Source

Mechatronics

In order to succeed against tough technological competition, new products have to satisfy increasingly demanding requirements. Cycles of innovation are becoming shorter, and therefore so is the time available for product development. This requires an extraordinary degree of effort, especially for mechatronic systems: after all, this is a place where all of the relevant engineering disciplines have to work together optimally throughout the entire development process.

Interdisciplinary Thinking and Action

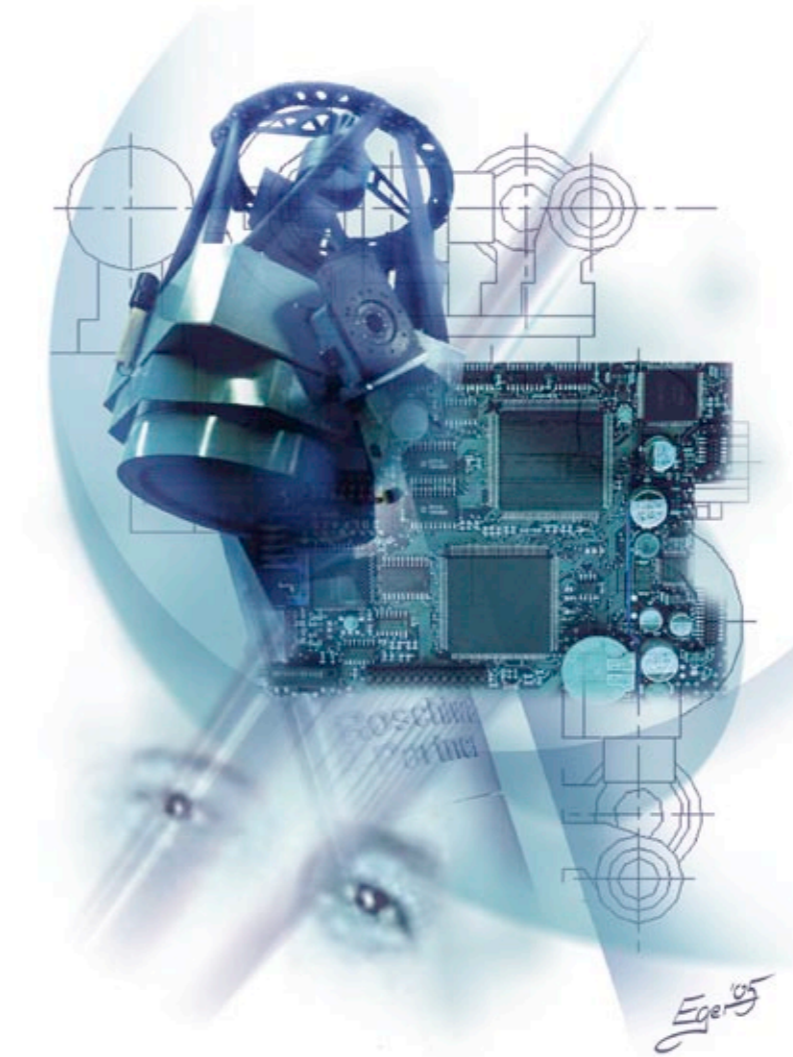
We cope with the complexity of mechatronic products by drawing on our electronics laboratory, Roschiwal + Partner Electronic Systeme GmbH. This generates synergy effects which make possible innovative, integrated solutions for our customers. You receive everything from a single source, with guaranteed short lines of communication, smooth execution and a constant point of contact.

$$\text{Mechatronics} = \sum(\text{Mech} + \text{El} + \text{IT})$$



Development of Miniature Devices

The subject of mechatronics has been a major priority for us for many years, especially the development of miniature devices. For us, mechatronic development means ensuring the function of a technical system by closely linking its mechanical, electronic and data processing components.



Development Examples

- A few examples:
- Diesel-electric hybrid drive for busses,
 - Electric planetary gear unit (EPG),
 - Electric ejectors for injection molding machines,
 - Electromechanical vacuum control module,
 - Electromagnetic suspension strut,
 - Housing for cryonic tweezers,
 - Laser range finder,
 - Laser range scanner,
 - Weld gun drive unit,
 - Swivel drive for A380 passenger door,
 - Small-flange vacuum valves

*Agreements Appropriate
for the Task*

The level of difficulty of the tasks and the special position of trust involved in development projects mean that it is in the best interests of both the customer and the contractor to conclude formal contractual agreements that are appropriate for the task. This way, both parties can proceed confidently with the development project.

*Master Contract for
Engineering Services*

In cooperation with our customers over the course of many years we have settled on a basic framework for contracts that describes the development process precisely, and covers all of the important points:



Fixed Price

We provide our services for a fixed price, and with a fixed deadline that is defined in the contract. Our customers – technical and commercial staff alike – can thus be confident that the order will be completed on time.

Compensation

Monthly interim statements corresponding to the progress of the work make the services already performed clear in commercial terms as well.

Execution

The “Execution” section addresses the design engineering process in detail, including full descriptions of the individual phases such as the development phase, design engineering, and documentation of the components. The drafting standards and company standards and DIN standards which must be observed, the date and mode of delivery, the alternative proposals chosen and similar basic agreements are defined here.

*Complaints
Liability*

Complaints and liability are also treated. Before leaving Roschiwal + Partner, all drawings and production documents are subjected to a 100% dimensional and functional check based on the assembly drawing and bill of materials. If errors should nevertheless find their way into the documentation, we naturally will rectify them free of charge.

*Industrial Property Rights
Rights of Exploitation*

The passage regarding industrial property rights and rights of exploitation states the following: The customer is solely entitled to inventions which are made under customer contract, and these rights will of course be transferred to him. The German law regarding employee inventions must also be observed here.

*Security
Secrecy*

Secrecy is a major consideration: Both parties undertake mutually to handle business secrets, oral information, special work methods and contract and working documents with strict confidentiality, even after the termination of the contract. This facilitates open cooperation based on trust. Our employees and other personnel are also subject to this obligation to maintain confidentiality, with agreements that the most severe sanctions permitted by German industrial law shall be applicable.

*Partners
and Project Managers:
Your Contact Persons*

*Successful Projects
through Organization (Among
other Things)*

Successful service providers have a task-oriented organization that maximizes the benefit to the customer. Extraordinary flexibility in project execution and systematic project management are only possible if the technical team has a flat hierarchy.

*A Single Organizational Form
for all R+P Companies*

An organizational form with small cells facilitates a flat hierarchy, efficient work, and quick and flexible adaptation to the customer's standard practices. All Roschiwal + Partner companies operate using the organizational principle of profit centers.

*The Project Manager:
Your Contact Person for a Project*

At Roschiwal + Partner, the managing director is the "first among equals". The partners are co-shareholders, and as the persons responsible for contact with the customer, they think entrepreneurially to ensure a high level of cost-effectiveness. As a project manager, the partner is directly responsible to the customer for the execution of the project.

Depending on the task, project groups generally consist of three to twelve staff members. This is based on the personnel requirements and the contractually agreed duration of the project.



Networked Locations for Innovative Product Development

*Three Locations,
a Single Corporate Goal*

Our office building is a service center planned by engineers, for engineers: Process-oriented office layout, internal and external networks, knowledge management, linked CAD systems. A target-orientated work process, enhanced by task-specific planned offices, increases the well-being of all of our staff members and thus ensures the quality of their work, and ultimately benefits our customers.

*Roschiwal + Partner
Ingenieur GmbH
Augsburg, Germany*

Due to the quantity of incoming orders and the constantly increasing number of staff members, our main building was planned just three years after the company was founded, and was built one year later in 1988. The "design engineering tower" was built in 2001, and was actually planned for use in the future. However only three years later the future caught up with us and 2004 the tower was completely filled with work stations.

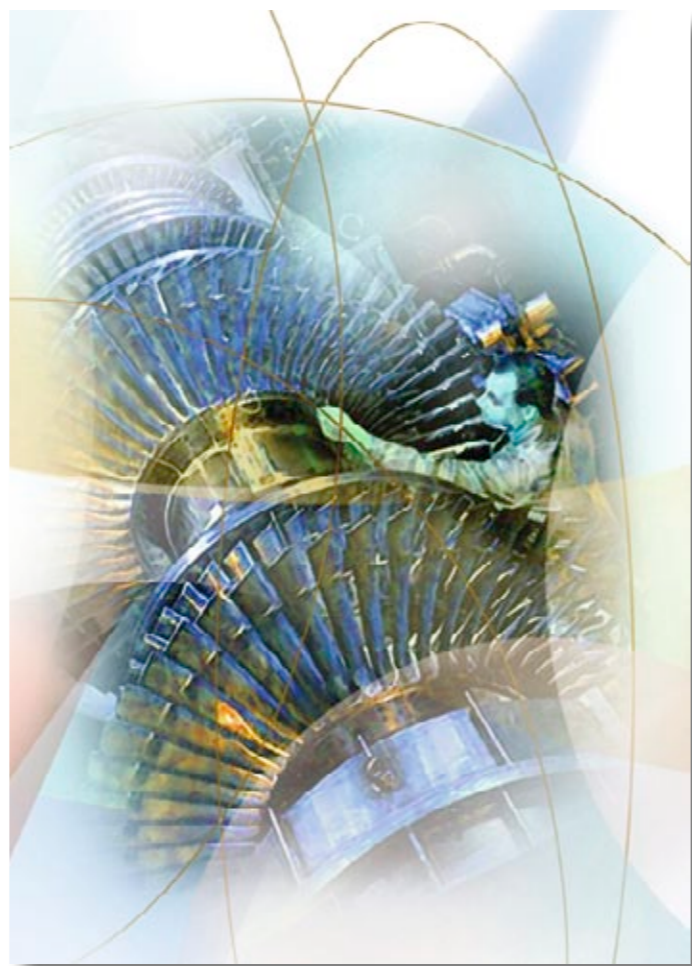
*Roschiwal + Partner
Ingenieur GmbH
Berlin, Germany*

Our sister company in Berlin was founded in 1985, while the city was still divided. Today it is based in the southern part of Berlin. In 2000 the company moved into its own building in Eichwalde, where the border of our property runs right along the city limits. At about 15 minutes by car from the A10 autobahn and 25 minutes by car from Schönefeld airport, this location is very easy for our customers to get to.

*Roschiwal + Partner
Ingenieur s.r.l.
Timisoara and Resita,
Romania*

Motivated by the effects of globalization and the eastward expansion of the EU, in 2000 we founded a subsidiary in Timisoara, Romania, which then moved into its own office building only two years later. In 2008 we were able to add a second location in the city of Resita. We cooperate very closely with our Romanian colleagues, and this begins by training each Romanian colleague for a year in Augsburg or Berlin. The goal here is for them to get to know our standard company practices, and for them to make our demanding corporate goals part of their thoughts and actions – for our customers' benefit.





The Art of Design

www.roschiwal.com