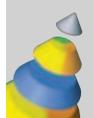


RÖSLER[®]
finding a better way ...

www.rosler.us



*Aero engine / Airframe
Preparation and Finishing*





Aerospace centres of excellence
and areas they are responsible for.

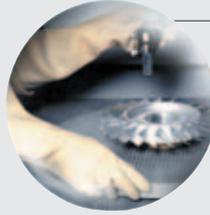
-  Germany
-  France
-  Great Britain
-  USA
-  China



DIN EN ISO 9001



Surface Treatment Activities



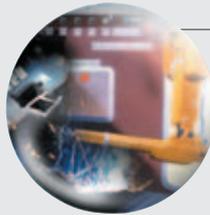
- ▶ Test centres
- ▶ Standard range
- ▶ Dry process
- ▶ Wet process
- ▶ Water-jet cleaning
- ▶ Shot peening
- ▶ Stripping
- ▶ Plunge grinding and drag finishing
- ▶ Vibratory finishing
- ▶ Abrasive or media selection

Draft Project



- ▶ Mechanical engineering
- ▶ Automation engineering
- ▶ Turn key

Manufacturing and assembly



- ▶ Design engineering
- ▶ Robotics/CNC
- ▶ Supervisor system
- ▶ Acceptance tests

Starting up

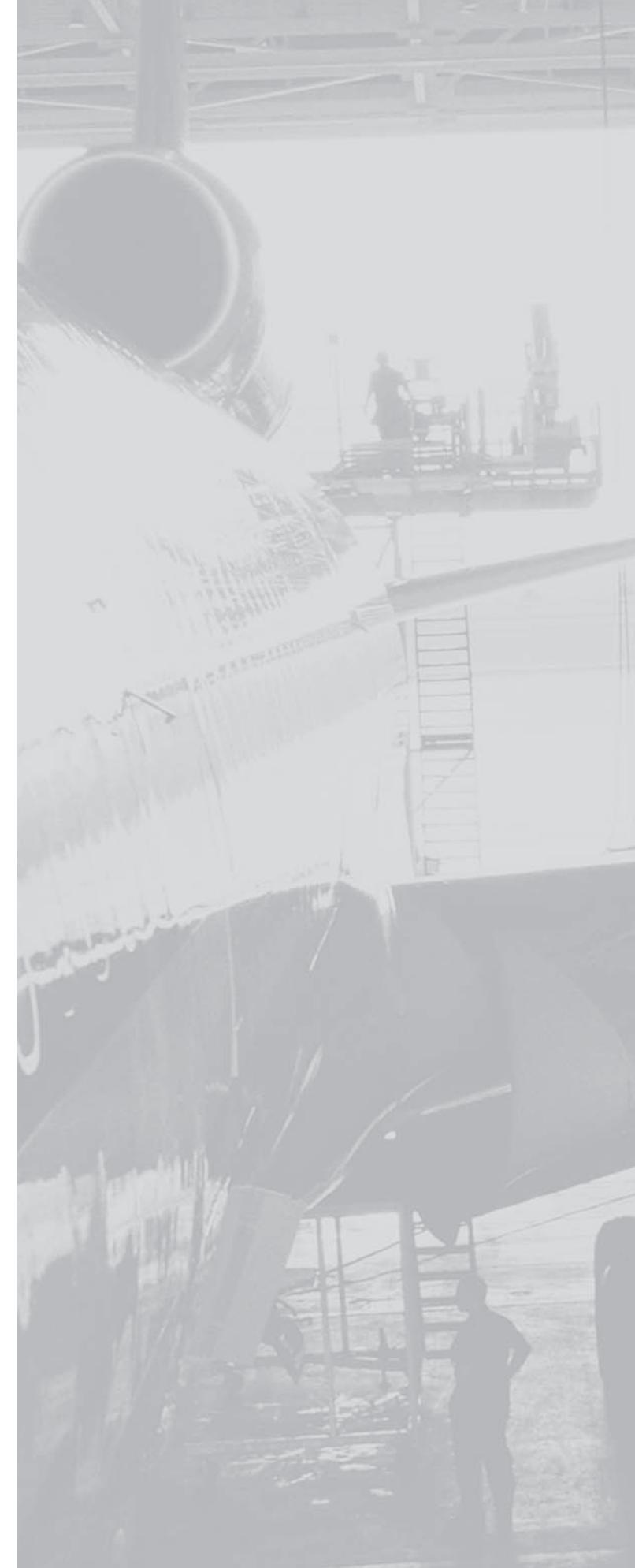


- ▶ On-site assembly and testing
- ▶ Commissioning
- ▶ Training

Service



- ▶ After-sales service
- ▶ Maintenance contracts
- ▶ Spare parts
- ▶ Abrasives and consumables





Rösler is the world's leading producer of surface finishing equipment together with related abrasives and water treatment. Our machine build programme includes shot blasting / shot peening, vibratory and high-energy abrasive finishing systems.

Our research and development programmes have in recent years produced many surface finishing processes now widely used in the world's high tech industries, with aerospace in particular benefiting from them. With the integration of Aerospace Specialist Vapor-Blast we can now offer a solution to all surface finishing and blasting applications.

Rösler's worldwide centers of excellence are set up to perform surface finishing process trials on customer's components, offer ISO-accredited sub-contract finishing services, -as well as provide full after sales support that includes service, spares and a comprehensive inventory of abrasives.



Aero Engine and Air Frame finishing on both new and rebuild is now a major part of Rösler's involvement in aerospace. Our unique Keramo® process produces surface finishes on engine blades, rotors and stators, that yield significant engine performance improvements in terms of reduced specific fuel consumption, exhaust gas temperature margins and limited metal removal.

Our innovative use of a robot (Roboblaster), for shot-peening aero engine blades has improved consistency of quality for a major aero engine manufacturer.



Standard range of air blast cabinets

These highly flexible, easy-to-use machines are designed on the simple principle of accelerating the abrasive with air (pressure or suction), and are particularly suited to small and medium production quantities.

Mobile blast unit with instantaneous recovery

Fitted with an annular brush mounted on a gun, these machines project, recover, separate, clean and recycle the abrasive. Not requiring special protection for the operator, they are designed for local stripping, weld cleaning and peen forming:

- ▶ Vacjet AC: suction fed.
- ▶ Vacjet PF: pressure fed.



Vacjet PF mobile unit

Manual blast cabinets (dry process)

A wide range is available from 0.5 to 3.5 m³ capacity, supplied in two versions:

- ▶ Suction fed.
- ▶ Pressure fed.

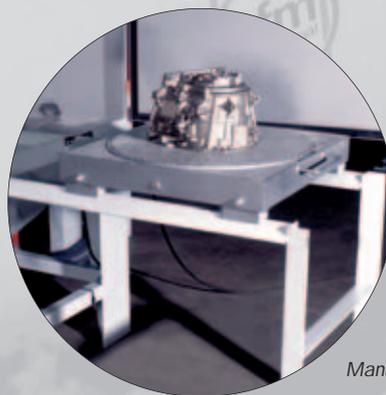
Models of advanced design, they combine efficiency with ease of use and environmental compliance. Prefiltration by micro cyclones reduces abrasive consumption, protects the final filter and allows blasting with fine abrasives.



210S model



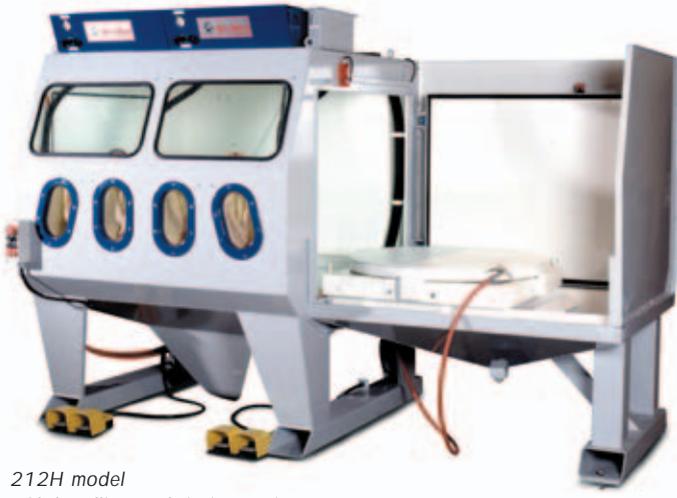
106S model



Manual carriage and turntable

Manual blast cabinets

6 cabinet models are available from 0.3 to 3.5 m³ capacity.
They are supplied in stainless steel.



212H model
with handling and rinsing station



210H model
with vertical carriage
and motorized shaft

Special equipment

The following optional special equipment can be fitted to
the standard machines:

- ▶ Motorized barrels,
- ▶ Motorized turntables,
- ▶ Automatic x-, y- and z-axis controls,
- ▶ Handling stations,
- ▶ Sieving,
- ▶ Spiral separator (dry process),
- ▶ Rinsing and settling tanks (wet process),
- ▶ Semi-automatic doors,
- ▶ and many more features.



Manual turntable



Eclipsable motorized barrel



Shot blasting: Dry processing

Fitted with automated systems, CNC systems or robots, these machines will produce results in accordance with your requirements at high throughputs. With their multiple nozzles operated simultaneously or sequentially, these systems are used for all types of mechanical surface treatment (deburring, stripping, shot blasting, shot peening etc.).

If required, a supervisory system can be fitted for real-time full control and monitoring parameters as well as for production traceability.

User-friendly software provides a variety of custom menus for access to a number of functions:

- ▶ Machine status display
- ▶ Fault and alarm management production
- ▶ Monitoring control of variable treatment parameters (part number, operator's name, pressure, flow rate, treatment time, etc.)
- ▶ Maintenance aids
- ▶ Report output at the end of the cycle.



Recommended Rösler abrasives

Glass beads: dedicate cleaning, satin finishing, engine part renovation.

Bright-Shot glass beads: special glass beads for shot peening.

Aluminium oxide: precoating preparation, stripping.

Plastic media, fruit stones, wheat starch: paint removal from metals and composite materials.

Ceramic beads: satin finishing, cleaning, surface improvement.

Steel shot: shot peening, peen forming.

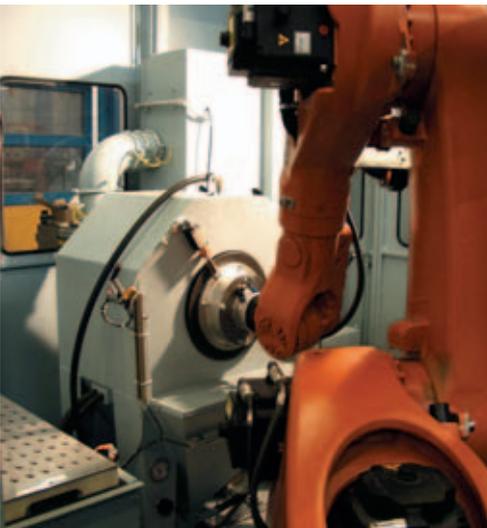
Continuous feed loop belt machines, model SBI

SBI machines are mainly used to clean and descale engine compressor blades and vane assemblies after heating and forging processes prior to vibratory finishing. A thru-feed, multiple nozzle, compressed air system incorporating our special polyurethane V-shaped loop conveyor belt, which gently tumbles and conveys the components through the blast stream.



Roboblaster for turbine and compressor blades plus vanes

The operating scope of this high performance blast wheel and injection system with single-arm robot comprises deburring, shot peening, and surface finishing, as well as compression blasting of impact sensitive components of various dimensions. If you are using shotblasting technology and you are planning on implementing or increasing the automation involved in your operation, think robo-handling. The system comprises definition of the size, the performance and the technical parameters of the robot to be used, as well as determination of the design of transport systems.



Air tumble belt batch machines, model range RMBC

The tumble belt batch machine injection system is equipped with a perfect pressure system including several nozzles.

Multiple nozzles reduce the processing time.

Descaling of non-sensitive components as a batch application.



Satellite table indexing blasting machines

With the satellite table indexing blasting machine, targeted, careful, non-contact finishing of different kinds of components and variable capacities is possible in the same machine.

The entire spectrum of blasting applications ranges from delicate deburring to shot peening. The installation is of particular benefit in applications where only specific sections of the components need to be blasted, not the entire surface.



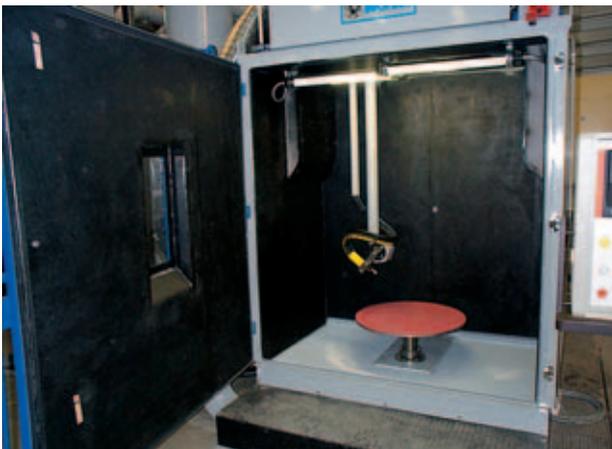
Surface preparation



Surface preparation for compressor and turbine shafts

With our expertise in shot blasting technologies, our machines are dedicated to surface preparation for plasma coating, painting, etc., and are designed to achieve consistent high-quality finishing results. To achieve excellent coating results, you need to begin with a perfectly finished surface.

With a suction or pressure blasting system, a gantry CNC system or robot, and full process control via PC or display device, we can provide the tools needed to meet the most stringent surface preparation specifications (roughness, coverage, yield, etc.) for a perfect finish.



TURBOMECA CNC machine for plasma preparation



Wet process

Glass bead blasting by wet process

With 50 years of experience, Rosler is the undisputed market leader in mass finishing and is strategically positioned to offer a wide range of blasting solutions. The wet blasting process is used for surface improvement, cleaning, stripping, precoating preparation, deburring, shot peening, and contaminant removal. The surfaces treated by the wet process come close to perfection as far as physical/chemical cleanliness is concerned. This process is particularly suited to the treatment of delicate, precision machined parts.

The main advantages are:

- ▶ No dust
- ▶ Ability to use very fine abrasives.
- ▶ Reduced fragmentation due to the water film (ideal for shot peening using glass beads).
- ▶ Reduced risk of inclusions (especially on soft metal) as water has a cleaning effect.



Recommended Rösler abrasives

Quartz and silica cleaning of mechanical parts and tools.

White aluminium oxide: precoating surface preparation, surface cleaning and preparation on plastics.

Spheric Shot beads: mould and miscellaneous part renovation and cleaning.

Bright Shot beads: wet shot peening, surface blending.

Additives: antirust compounds, non-stick compounds, etc.

Equipped with similar features as the dry process equipment, the special wet process systems are fitted with automation systems or numerical driven systems to control the blast nozzles' movements as well as the handling of the treated parts.

Cleaning, contaminant removal, stripping, precoating, surface preparation and shot peening with glass beads are carried out with the highest conditions of reproducibility. Parameter optimisation guarantees high quality.

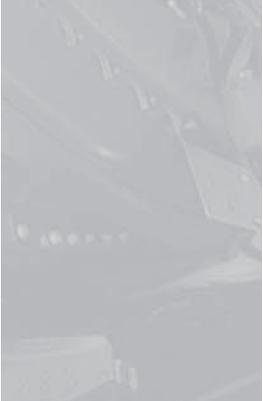
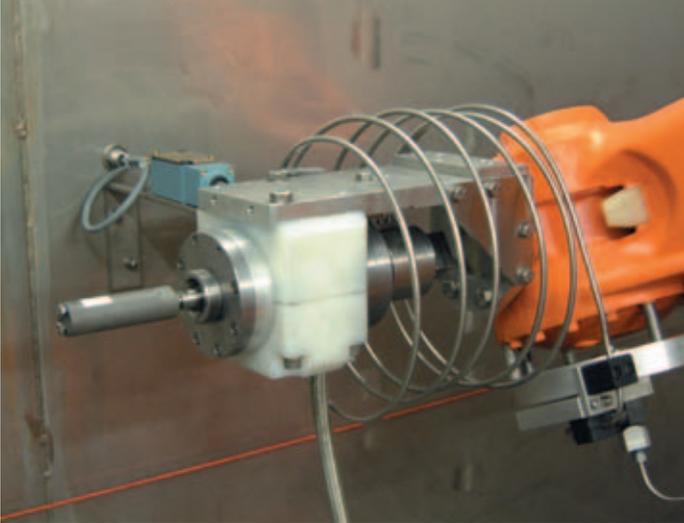
Special equipment can be added to these machines:

- ▶ Water/abrasive mixture concentration control.
- ▶ Cyclone separator / hydrocyclone.
- ▶ Continuous media classification (in particular size ranges).
- ▶ Filtration and settling tanks for residual water.

Blade treatment



Surface preparation before plasma coating

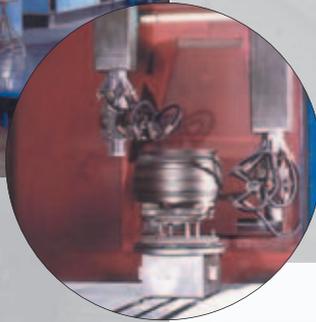


Water-jet cleaning

Automated equipment for stripping engine parts using a high pressure water-jet up to 4000 bar

- ▶ Cleaning
- ▶ Stripping of very hard barrier coatings
- ▶ Environmentally safe. Used in order to replace chemical stripping
- ▶ Water recycling system
- ▶ Follow-up and control from a supervisory computer





Shot peening machine for engine parts
CNC NUM 1060 – 10 axis

- ▶ Shot peening machine
- ▶ Robot ABB 6 axis + turntable
- ▶ 2 steel shot sizes
- ▶ Spiral separator
- ▶ Continuous sieving
- ▶ Supervision system



Shot peening machine for airframes



Shot peening

Shot peening is an important and often vital process in the aerospace industries. Originally done manually with a ball-peen hammer, shot peening today is a high-tech process to reduce all types of stresses, including tensile, compressive, and bending stresses, thus stabilising and increasing component life.

Rösler's R&D programmes began with the ball-peen hammer and developed it into a wide range of equipment for controlled and monitored shot peening with Rösler's robotic systems playing a major role.

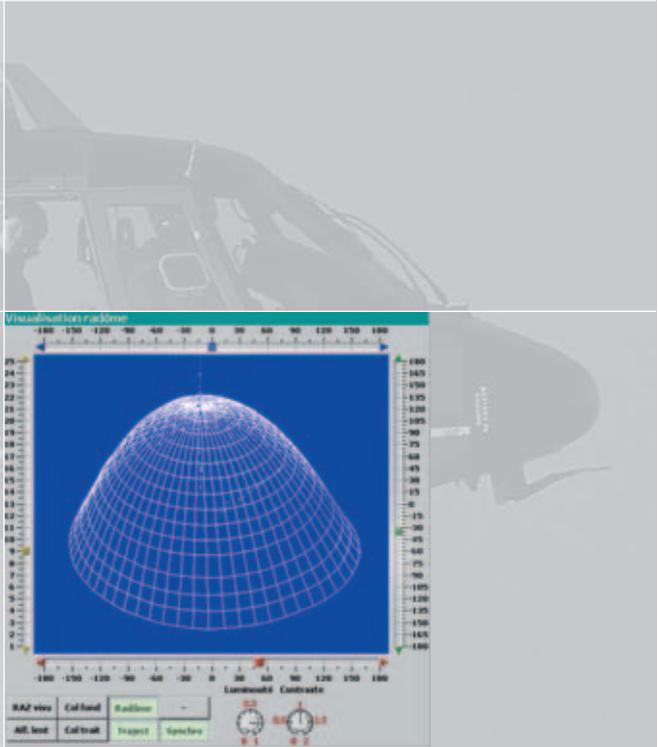
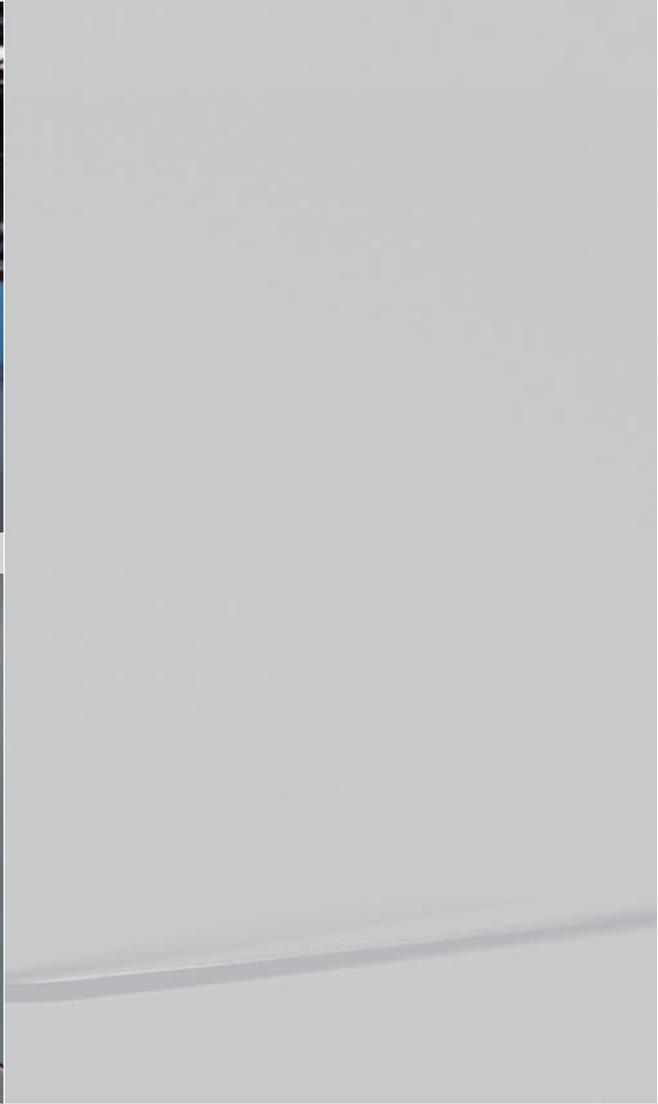
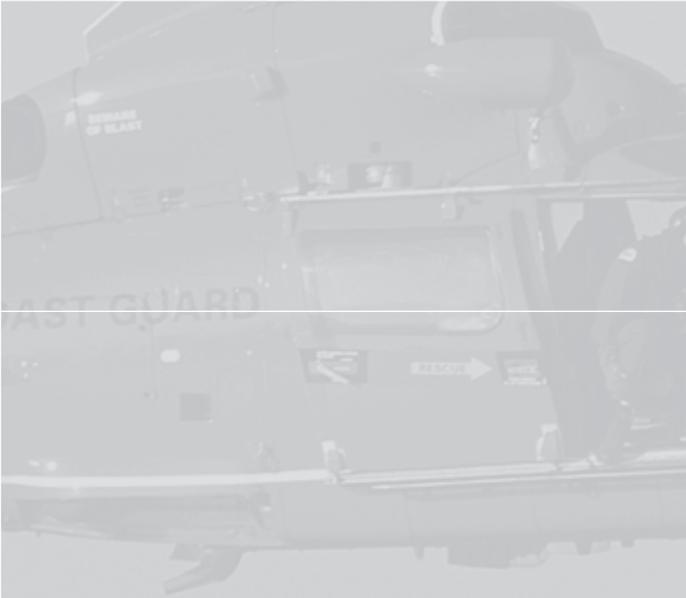
Aero engine blades, discs, shafts and airframes are now all peened at some stage in their production cycle.

Engine blades during overhaul are often peened in order to re-induce compressive stress, thus considerably reducing the possibility of fatigue cracks when back in service.



*Eurocopter
Shot peening 6-axis robot + 4 external axis*





Stripping

Aeronautical paint removal using starch blast media.

- ▶ This process, using a wheat starch, is used for automatically or manually removing paint from composite or metal substrates.
- ▶ Paint removal can be complete (substrate stripping with no surface condition change) or selective (primary coating retained).
- ▶ For uniform paint removal, Vapor Blast developed a special nozzle. Compared with conventional cylindrical nozzles, this special nozzle provides optimised distribution of the media over a larger area (the hot spot is eliminated).
- ▶ In the automatic mode, the paint removal operation is performed using a 6-axis robot (or a 7-axis robot when installed on a longitudinal carriage).
- ▶ The paths are generated by a laser beam providing 3D mapping of the part to be treated.
- ▶ Up to 30 times faster than manual stripping



Paint removal from aircraft composite parts (radomes,...)





Plunge grinding and drag finishing

The Rösler range of high power drag grinding and polishing machines has started to play an ever increasing role in the finishing needs of the aerospace industries.

The basic principle of drag finishing is the controlled movement of a spindle-mounted component in a static abrasive mass.

There are many benefits with this type of finishing.

- ▶ 100% protection against impingement of heavy and/or delicate aerospace components
- ▶ Cutting rates greater than normal vibro or high-energy systems
- ▶ Low Ra values
- ▶ Access to difficult to reach areas of component
- ▶ Even surface coverage

Rösler drag finishing offers the ideal solution for turbine blades and vanes, particularly multi-span assemblies which formerly have been finished by hand or chemical processes.





Rösler rotary vibrator lines including drying systems and waste water treatment (centrifuges)
Finishing of engine blades



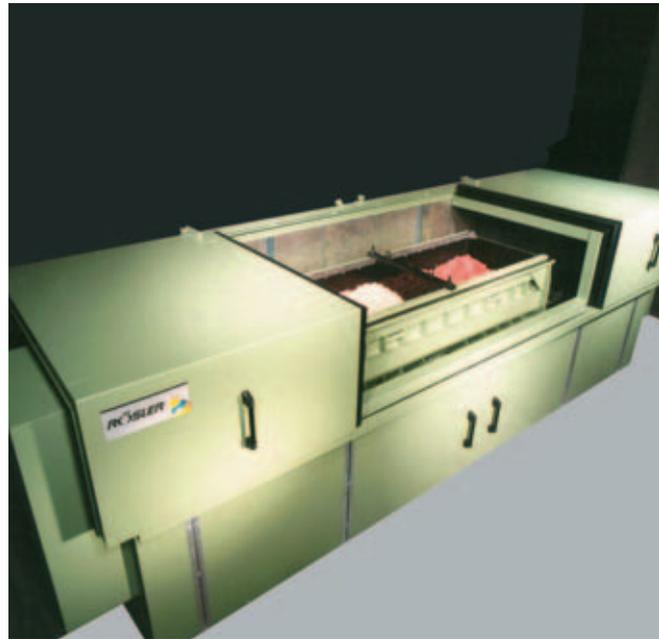
Vibratory finishing

The surface finishing of casings and large structures on both new and re-built aero engines and air frames has always been expensive. The surface finish is important because surface smoothness and blending of machine marks and sharp corners improves engine performance, fuel consumption and safety.

The work is often carried out manually, requiring a high skill level. Unfortunately, this method produces variations in finish and thus quality problems.

Throughout the aerospace industry, there are many types of Rösler vibratory machines in use finishing large structures.

A specialised range of circular vibratory bowls, designed without a centre column, is used to surface finish blisks and complete stator rings. The action of the abrasive media in this type of machine is excellent, giving good media coverage over all airflow surfaces.



*Special wide range through vibrator
Finishing of large wing spars*





Surface finishing chips and compounds

These are the perfect basis for all surface finishing processes. They ideally combine environmental aspects with high precision and quality of process technology.

We are committed to continuous improvement of our products and processes in our laboratories and test centres. By our doing so, you have the assurance of being at the forefront of surface finishing technology. As a result, we are always developing new opportunities in choosing the correct application for your surface finishing process.

Effective checking of incoming raw materials and finished products to DIN EN ISO 9001 standards ensures the high quality of our consumables.

Regardless of whether standard products or special products are used, you can be sure that environmental protection accompanies your surface finishing operations with each process.

Quality of Supply

In our central storage facility and in the storage facilities of our subsidiaries worldwide, we are continuously supplying around 8,000 types of high quality consumables.

Selecting the right shot media

Your guarantee of high quality production

4 criteria:

Process

- ▶ Compressed air: dry process, wet process.
- ▶ Airless system.

Treatment

- ▶ Shot peening.
- ▶ Precoating preparation (Roughness: Ra).
- ▶ Finishing (appearance).
- ▶ Cleaning.
- ▶ Deburring.
- ▶ Stripping.
- ▶ Contaminant removal, etc.

Parts to be treated

- ▶ Shape, weight, hardness.
- ▶ Geometry, tolerances.

Production requirement

- ▶ Throughput.
- ▶ Quality level.

Rösler offers 7 families of abrasives and products:

1. Aluminium oxide.
2. Glass beads.
3. Ceramic beads.
4. Quartz and silica.
5. Plastic media.
6. Starch blast media.
7. Metallic shot.

The families (1), (2), (3) and (5) can be used for dry and wet processes (air blasting).

Quartz and silica (4) are reserved for wet sand blasting operations (not useable for the dry process)

Vegetal media (6) is used for the dry process (pressure).

The families (3) and (7) can be used both in airless and air blasting (dry process)

All abrasives or products currently available in the market are distributed by Rösler.

A supply department and dedicated work offers the following services: treatment of unit parts, preproduction, etc.



Test Centres and Service

Finding a better way... a commitment to our customers

Test Centres worldwide

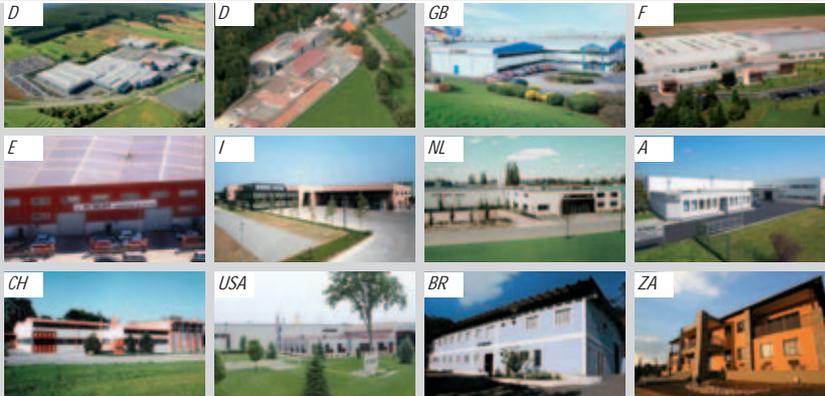
Throughout our worldwide organization we adhere to strict quality control procedures. This applies especially to our test centres where we develop process solutions for all kinds of surface finishing problems. Each branch of the Rösler group features its own test centre equipped with the latest Rösler finishing equipment. This equipment is utilized exclusively for processing trials with our customer's sample parts.

For Rösler service is not just an empty promise

Professional advice, short turn-around times and prompt and reliable after-sales service: Rösler offers single-source surface finishing solutions, on a worldwide basis!

- ▶ Installation and training
Machine installations and operator training are performed by our team of highly skilled and experienced service engineers.
- ▶ Spare parts service
Surface finishing equipment generally is subject to a considerable amount of wear. For this reason preventive maintenance and prompt supply of spare parts are a key requirement for any surface finishing installation. Rösler maintains a complete inventory of spare parts in every branch, ensuring local supply and fast availability, be it wire mesh belts, blasting wheels, pressure vessels or any kind of nozzles, etc. To minimize downtime, parts are either delivered and installed by our own field service personnel or shipped to our customer's location overnight.
- ▶ Maintenance and repair service
Rösler maintains a well trained staff of professional field service engineers providing prompt, reliable maintenance and repair service at competitive rates as well as overhaul of your older equipment.
- ▶ Professional advice
Our finishing specialists stand ready to provide information regarding any kind of question relating to specific surface finishing problems. With decades of experience we will be able to provide you with the right answers.





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- and more than 60 representations worldwide

