

# Robot Precision Polishing

Tools and Molds with 2D and 3D Geometries



Ball polishing of double-curved mold surface



Stick polishing of bottom radius



Polishing of a metal forming punch

# THE IDEA OF RAP® - ROBOT ASSISTED POLISHING

The surface quality and dimensional precision of tools, molds and industrial components has a great influence on their performance and service life, and therefore such complex tools and industrial parts require surface polishing by highly skilled individuals. However, manual polishing is increasingly perceived as a physical and mental troublesome work process, that puts high demands to the trained polisher.

STRECON is introducing a robotic machine system designed for high-quality surface polishing. Our approach is RAP®, which is an acronym for Robot Assisted Polishing. RAP is based on the skills and profession of manual polishing at which the work

process is transferred to an industrial robot carrying the polishing tool.

The RAP machine system is to be programmed, set-up, and monitored for obtaining the specified surface quality of the parts, and this responsibility remains with the skilled operator. However, once the polishing process has been set, the machine runs automatically with limited assistance from the operator. Depending on the specific part, the polishing machine system can perform all or a significant portion of the polishing job, for then leaving the machine settings, quality control, and final surface finishing to the operator.



Example of RAP machine



Example of tool change



Example of part change

## SALES CONTACT

The RAP technology is offered as projects meaning that a specific RAP equipment solution is defined in collaboration with the customer and considers the type of parts to be machine polished as well as the yearly volume, processing time, and need of automation and system integration. RAP projects are offered for precision polishing of metal forming tools, injection molds, and other comparable parts in complexity, size, and volume.

Customers interested in the pioneering RAP technology can contact STRECON in the following ways:  
Telephone: +45 74487788 · Email: [info@strecon.com](mailto:info@strecon.com)

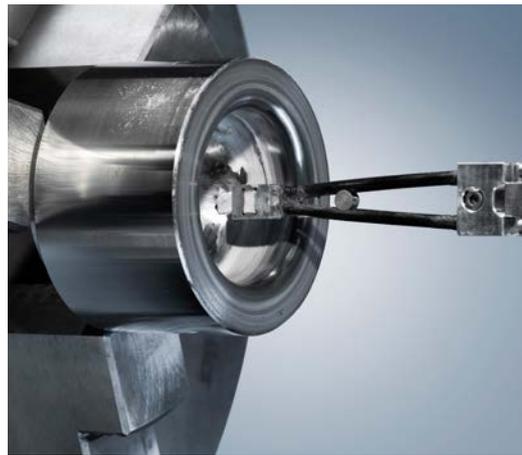
Further information about RAP can be acquired by visiting STRECON's homepage at [www.strecon.com](http://www.strecon.com)

## 2D ROTATION-SYMMETRIC SURFACE POLISHING

The robotic machine system, RAP designed for 2D rotation-symmetric workpieces can perform precision polishing of the outer and inner curvature as well as the end surface.

The workpiece is clamped and positioned in a rotating spindle, whereas the polishing tool is fixed to the robot arm while directed to the targeted surface section of the workpiece.

The workpiece can be a tool for metal forming or injection molding but also applicable for other types of workpieces like cylinders, tubes, and discs. The workpiece can be of tool steel, tungsten carbide, or other materials subject for individual confirmation. A surface finish at Ra 0,02-0,04  $\mu\text{m}$  and Rz less than 0,1  $\mu\text{m}$  is achievable in a consistent and repetitive manner, and principally independent of the machine operator and the production batch.



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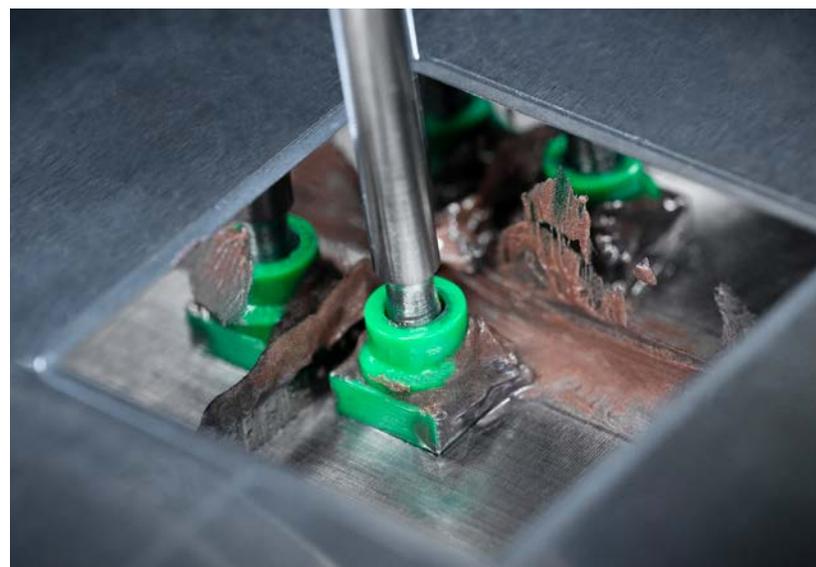
## 3D POLISHING OF PLANE SURFACES

The robotic machine system, RAP can be designed for precision polishing of plane surfaces (3D), for example inside cavities or submerged cavities (pockets).

The workpiece is fixed and positioned in a clamping station which could be an indexing and angle-adjusted table, while the polishing tool is fixed to the robot arm and directed to the targeted surface of the workpiece. The workpiece can be a tool for metal

forming or injection molding but also applicable for other types of workpieces. The workpiece can be of tool steel, tungsten carbide, or other materials subject for individual confirmation.

A surface finish of Ra 0,01-0,02  $\mu\text{m}$  and Rz less than 0,1  $\mu\text{m}$  is achievable in a consistent and repetitive manner, and principally independent of the machine operator and the production batch.



## 3D POLISHING OF CURVED SURFACES

The robotic machine system, RAP can be designed for precision polishing of curved surfaces and/or free-form shapes (3D), which are represented in manifold of different parts.

The workpiece is fixed and positioned in a clamping station which could be an indexing and angle-adjusted table, while the polishing tool is fixed to the robot arm and directed to the targeted surface of the

workpiece. The workpiece can be a tool for metal forming or injection molding but also applicable for other types of workpieces. The workpiece can be of tool steel, tungsten carbide, or other materials subject for individual confirmation.

A surface finish of Ra 0,01-0,02  $\mu\text{m}$  and Rz less than 0,1  $\mu\text{m}$  is achievable in a consistent and repetitive manner, and principally independent of the machine operator and the production batch.



## ROBOT ASSISTED MANUFACTURING, RAM

The development of the RAP technology for precision polishing using an industrial robot has led to a new conceptual platform named RAM, Robot Assisted Manufacturing. The RAM concept can be applied to manufacturing processes, which cannot effectively be achieved with conventional robot programming or manual Teach functions. Examples of such industrial precision applications could be deburring, machining of holes, slots, grooves and edges, gluing, measurement, assembly, and many other applications.

The machine programming is based on CAD/CAM compiled into robot movement programs and synchronously setting of the specific process parameters, for example spindle speed, force, torque, dosing etc.

Inquiries are handled as RAM projects and subject for individual specification, implementation, and quotation. Customers interested in this new robotic manufacturing concept (RAM) are welcome to contact STRECON.

## ROBOTIC PRECISION POLISHING FOR INDUSTRY

The RAP technology and machine system is particularly of interest for customers, which have a need for a fully controlled, consistent, repeatable, and traceable surface polishing process that can limit the dependency of individual operators while offering a much better work environment. The work of the operator is limited to tasks at which the machine system would come in short.

A RAP equipment solution for various metal forming tools can deliver a surface finish like Ra 0,06 – 0,04  $\mu\text{m}$ , and Rz below 1,0  $\mu\text{m}$  – or better if needed. For molds for plastic injection the surface finish could be specified in the range of Ra 0,03 – 0,01  $\mu\text{m}$ , and Rz 0,3 – 0,1  $\mu\text{m}$ , and consequently have a mirror or mirror-like appearance.

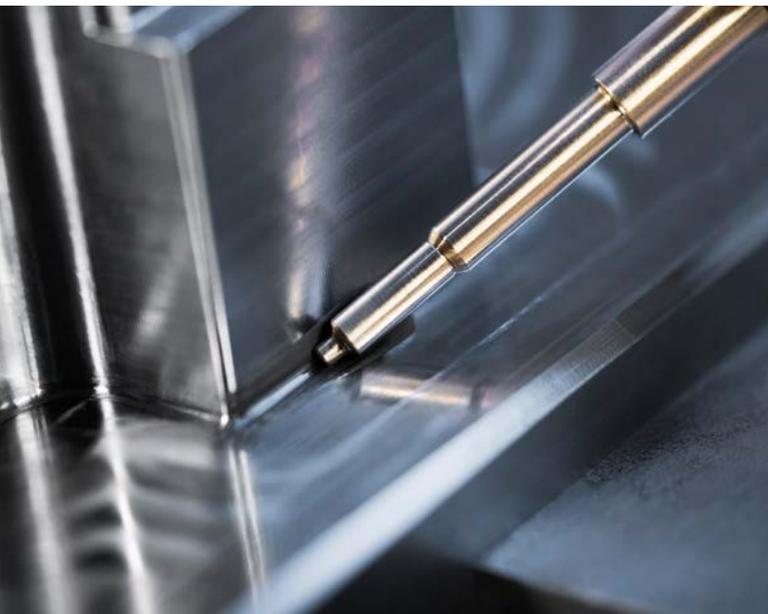
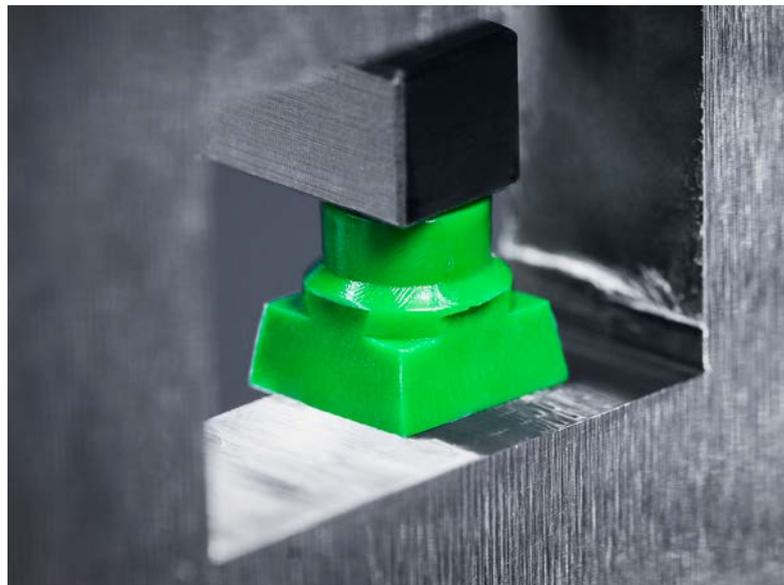
Programming of the RAP machine system is based on a CAD file, and the application software offers the setting of polishing process parameters such as the speed of the rotating spindle or indexing table,

speed of the polishing tool, contact force and angle to the work piece, robot feed speed, and number of polishing passes of selected arcs. The process programming of the RAP machine system for 3D polishing of plane and curved surfaces is based on a CAD file (STEP), and then subject for CAM programming and robot compiling before setting the RAP process parameters.

The surface polishing can be performed by different stones, brass, acrylics, wood as well as compound materials and felt combined with oil and/or diamond paste. In short, the robotic polishing process can be compared with manual polishing.

The RAP polishing machine technology has been proved successful for:

- Molds for injection of plastics and compounds,
- Tools used for metal forming operations, and
- Machine components such as tubes, cylinders, bowls, and many other part geometries.





STRECON A/S is a leading developer and manufacturer of prestressing tool systems as well as hydraulic machine and press systems based on the unique stripwinding technology. STRECON has also taken a lead in developing a robotic machine system for precision polishing of tools and molds with 2D and 3D geometries. STRECON is servicing high-end industrial customers and universities in Europe, Asia, and North America and recognized for its technologies, innovative solutions, and high-quality products. Most of the manufacturing as well as assembly and testing are performed at own facilities in DK-Sønderborg, the hometown of STRECON.

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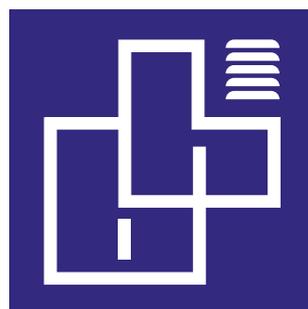
ALSMATIK A/S develops software and electrical hardware solutions for complete automation systems in close cooperation with our mechanical partners. We understand how to combine theoretical knowledge with practical experience and have an in-depth knowledge of all types of production. We see opportunities instead of limitations. ALSMATIK A/S has since 1997 solved numerous tasks for the industry in Europe with end customers all over the World.

In 2018, ALSMATIK A/S acquired the rights to PLCSQL Link, developed by one of the owners of ALSMATIK - a product that enables easy communication directly between PLC and SQL database, without the use of PC software. ALSMATIK has a high level of expertise in various servo motors, KUKA robots, Siemens PLCs and PC based control systems, including web systems and SQL databases.

ALSMATIK is a strategic partner to STRECON in developing the electrical system and machine controls for the Robot Assisted Polishing (RAP) equipment solutions as well as the new and broader RAM concept for Robot Assisted Manufacturing.

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