

# Functionalising of surfaces via machine hammer peening

## Increasing efficiency and quality of metal workpieces with robot-based surface-finishing

The functional performance of a component is to a great extent determined by the properties of its surface as well as the near-surface-layers. For example: the production of tools and moulds imposes special requirements on the surface of its components. Due to the frequently low lot size, an economical automation of the surface finishing was almost impossible to achieve until now.

### Objectives

By precise technological manipulation of the surface of the workpiece, it is possible to achieve a considerable optimisation of its wear and friction characteristics chemical durability as well as the static and dynamic strength. Therefore, since a couple of years Vienna University of Technology has been researching a new, innovative technology for surface treatment: *Machine Hammer Peening* (MHP).

### Approach

As part of the MHP surface treatment, a tool, usually with a spherical carbide metal tip, is brought into an oscillating movement of up to 500 Hz by an electromagnetic or pneumatic actuator system. The actuator is clamped into a machine tool or onto a robot and is thereby guided over the surface of the workpiece via CNC control. The actual surface modification is therefore achieved by individual, precisely defined impacts of the tip of the tool, which are arranged consecutively along a path. Each impact causes a mechanical reshaping at microscopic level and induces internal compressive stresses in the proximate subsurface zone of the



Functionalising a surface via automated hammering

workpiece. By appropriate selection of the process parameters, the surface characteristics can hence be adapted and dimensioned to the subsequently expected demands.

### Results

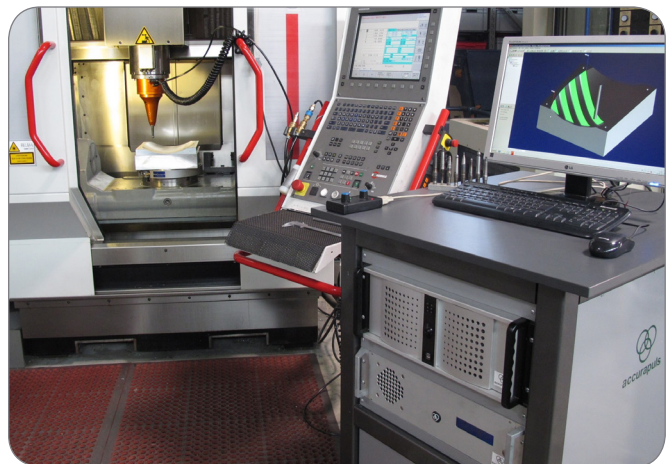
The MHP technology offers a wide range of options for the technical functionalisation of surfaces. A significant smoothing of a surface can be achieved by the material-specific optimisation of the process parameters. The induction of residual compressive stresses in combination with an increase of the surface hardness also leads to the improved wear performance of the treated components. Due to the research at TU Wien, it has been possible to extend the range of applications offered by the MHP technology to the mechanical embedding of coating materials, and to the targeted structu-

ring of component surfaces. As an example, the frictional resistance on the surfaces of hydraulic flow machines was reduced by more than 6%, by applying a functional riblet-structure. By embedding a coating material in the component, it is also possible to change the thermal and electrical conductivity on the surface of workpiece and finished products.



Special surface hammer which can be used in all standard industrial robots

On the basis of automated processes which are easily integrated into an existing production chain, MHP surface treatment offers wide-ranging potentials for precise and economical influencing of component characteristics.



Surface hammer peening - with conventional components

## Benefits for you

- Specific influence of structure and hardness, as well as the thermal, electrical and chemical properties of technical surfaces due to an automated processing procedure
- Integration into existing process chains without the necessity to reclamp the workpiece
- Can be used in all standard machining centres as well as on industrial robots
- Substitution of manual polishing processes in tool and mould construction of up to 80%
- Substitution of thermal hardening processes
- Extension of the lifespan of already worn tools or moulds – e.g.: by up to 50% with aluminium castings

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