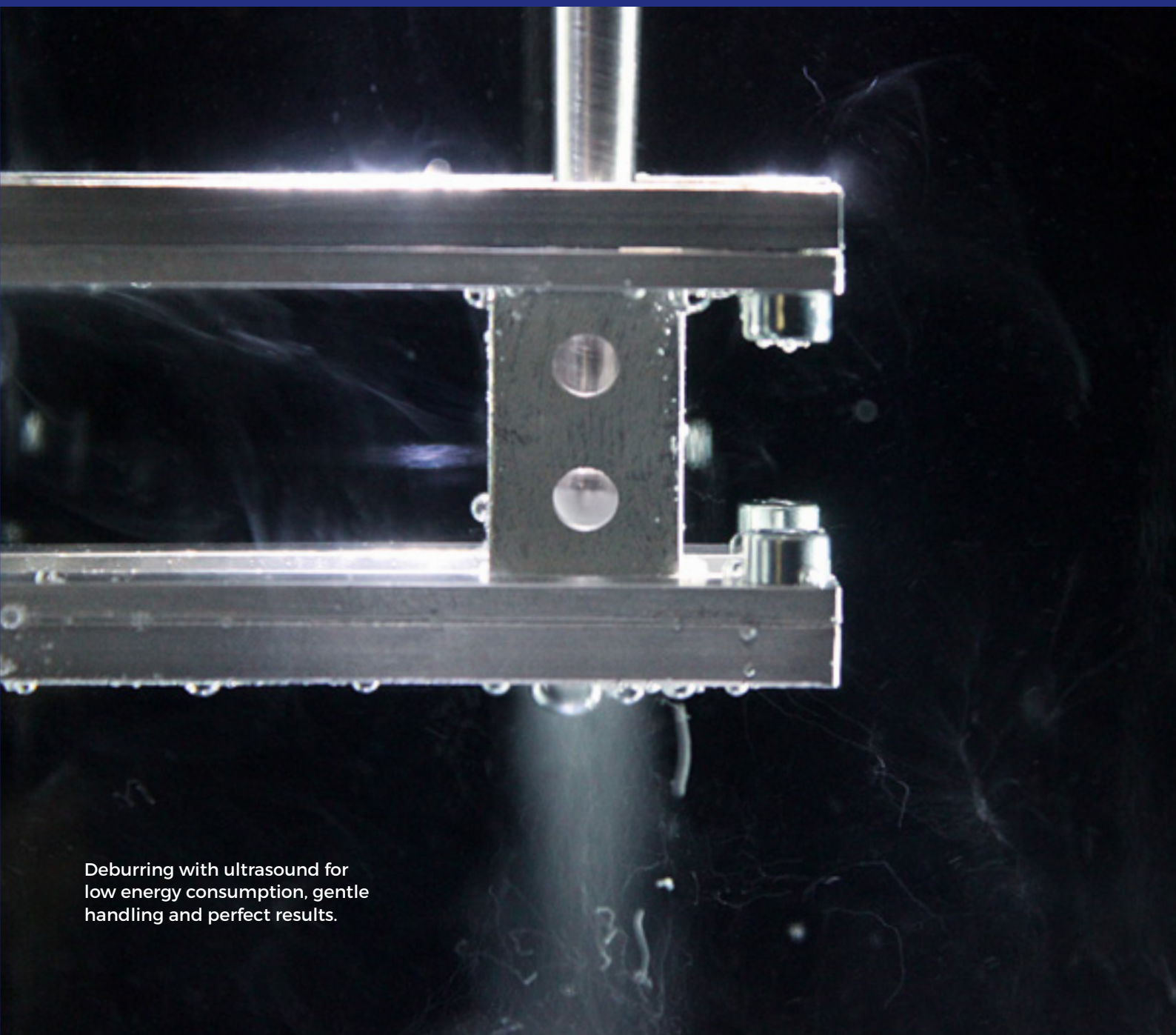
WEBER
ULTRASONICS

INNOVATION LAB

BURR-FREE AND CLEAN WITH HIGH ENERGY EFFICIENCY

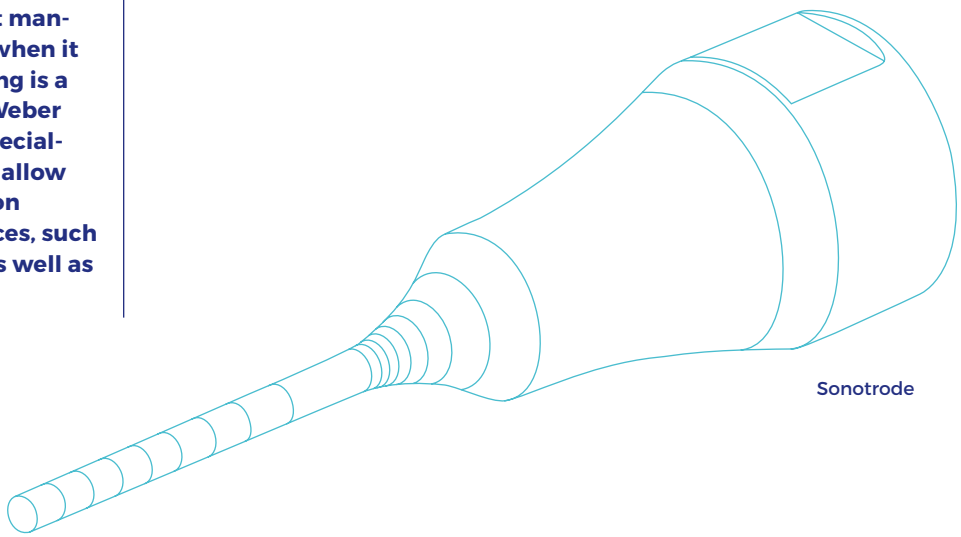


Deburring with ultrasound for low energy consumption, gentle handling and perfect results.

EFFICIENT DEBURRING WITH ULTRASOUND

CONTACTLESS REMOVAL OF INTERNAL AND EXTERNAL BURRS ON ALUMINIUM, DIE-CAST ZINC AND BRASS PARTS

Ever stricter demands for precision, process stability and profitability in component manufacturing also require new processes when it comes to deburring. Ultrasonic deburring is a development of the Innovation Lab at Weber Ultrasonics AG. The process employs specially developed ultrasonic components to allow targeted and reliable removal of burrs on internal and external component surfaces, such as die-cast aluminium and zinc parts, as well as injection-moulded plastic parts.



Sonotrode

Just like component cleaning, deburring is a key prerequisite for achieving a high level of quality and functionality in downstream processes and in the products themselves. Conventional deburring processes, such as high-pressure water jets, surface finish grinding, chemical and electrochemical deburring, brushing or manual deburring are characterised by high costs, untargeted material removal, a high environmental burden and the risk of secondary burrs.

RESEARCH – THE WEBER ULTRASONICS INNOVATION LAB

With ultrasonic deburring, the Innovation Lab at Weber Ultrasonics AG, technological leader in the field of ultrasonic components and solutions, is driving a new process that eliminates these disadvantages. Here, the company combines expertise from the fields of ultrasonic cleaning and ultrasonic welding, the latter of which in particular concerns the development and manufacture of the deburring tool – the sonotrode.

PROCESS – DEBURRING WITH ULTRASOUND

The deburring technology, developed and verified in collaboration with the Fraunhofer Institute for Manufacturing Engineering and Automation (IPA), is based on the physical effect of cavitation and a flow. A generator, whose frequency and amplitude have been matched to the deburring requirements, generates sound waves during this process. These are then applied to the workpiece using the specially developed sonotrode in a tank of liquid without chemical additives. This subjects the workpiece to intensive cavitation for a brief period. As the local cavitation bubbles implode, high forces and a powerful flow are generated in the liquid. This in turn allows the targeted and gentle removal of burrs at specific spots or across entire areas without thermal stress or the risk of creating secondary burrs.

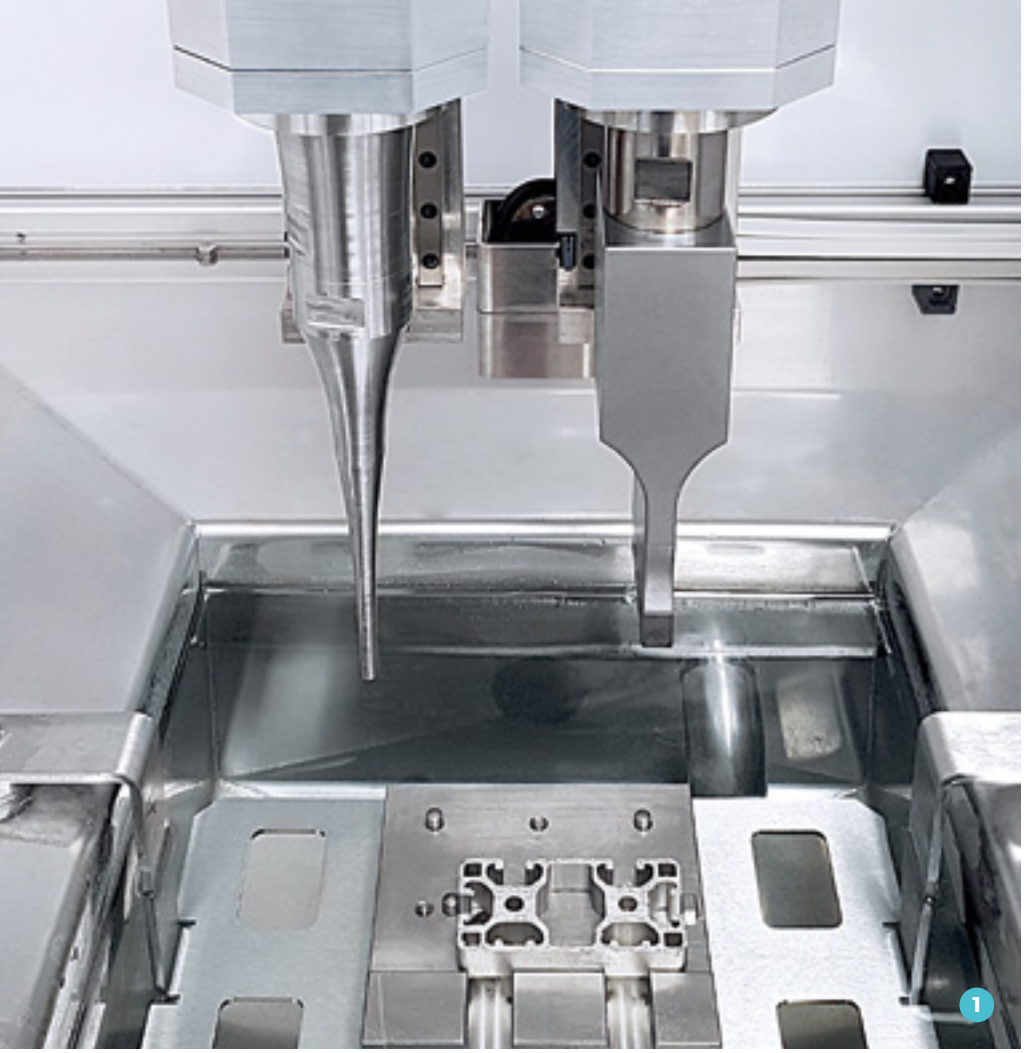
Ultrasonic deburring also impresses in terms of energy efficiency. In fact, it only requires around 1 % to 2 % of the energy of a typical high-pressure water jet process. In addition, deburring is performed more gently and with less material removal.

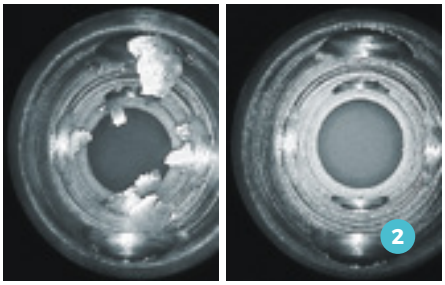
By adjusting amplitude, power output and the duration of ultrasound application, as well as the distance and position of the sonotrode relative to the workpiece, the process can be adapted to a wide range of deburring tasks. The ability to match the sonotrode very precisely to the component also makes a contribution to optimal machining results.

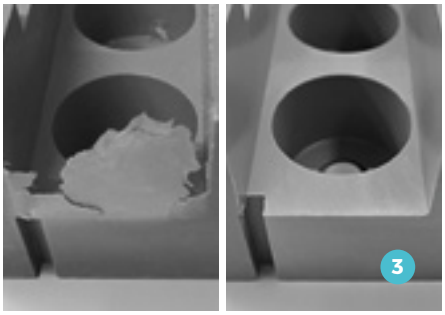
BENEFITS – BOTH INTERNAL AND EXTERNAL SURFACES OF METAL AND PLASTIC PARTS CAN BE MACHINED

Excellent results have been achieved in contactless removal of both internal and external burrs on die-cast aluminium and zinc parts, as well as brass parts. Even thin-walled workpieces can be machined. Cleaning of the surfaces is performed in parallel with the actual deburring process, which only takes a matter of seconds.

Deburring at the Weber Ultrasonics Innovation Lab





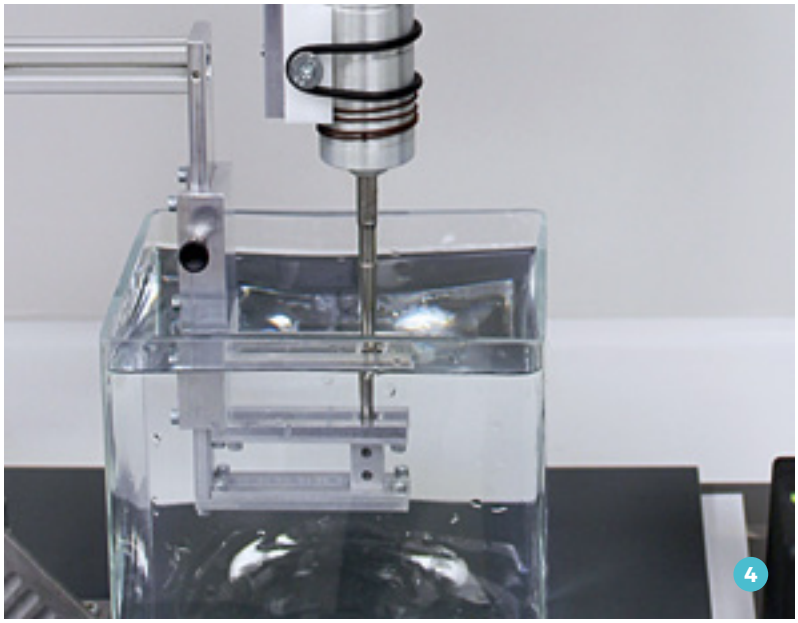


In the field of plastics, the new process offers a reliable and economic alternative primarily for injection-moulded parts made of polyamide (PA), polypropylene (PP) and polycarbonate (PC) – including fibre-reinforced parts. This allows burrs that occur at the separating layers of the injection moulding tools to be removed in a targeted way. In addition the process allows so-called "flashing" to be removed across the entire surface of parts.

> In comparison with high-pressure water jets, the new process excels through its significantly lower energy consumption, as well as its more gentle handling.

MANUAL AND AUTOMATED DEBURRING

Another advantage of ultrasonic deburring is its excellent versatility. For example, a mobile handheld deburring device can be used for various tasks, including those which previously took a lot of time and had to be performed manually using grinding stones or spatulas, i.e. during final inspection before packaging. The guided movement of the sonotrode is also just as easy to mechanise and fully automate. The latter allows the innovative process to be integrated into automated production lines. ▼▼



1 Prototype deburring system with two sonotrodes

2 Test specimen made of aluminium with cross holes and flaky burrs (on left: before, on right: after)

3 Injection-moulded part made of polypropylene with flaky burrs (on left: before, on right: after)

4 Test set-up in the laboratory

Deburring at the Weber Ultrasonics Innovation Lab

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