Meeting More Demanding Requirements for Removing Burrs: Optimizing Deburring Processes with Innovative Solutions

By Doris Schulz

Burrs and chips are unavoidable in virtually all manufacturing processes used for series production, and today, the removal of these remnants from the production process is an absolute must for high-quality, precision parts.

Whether parts are manufactured by means of machining, metal forming, or master forming, deburring usually doesn’t fall into one of the part manufacturer’s areas of core competence. Thus, the removal of these remnants from the production process is often still seen as a necessary evil that increases unit costs. However, due to ever-stricter requirements for product quality and functionality, intermediate and downstream processes like deburring are becoming more significant across all industry sectors. Additionally, component geometry is getting continuously more complex, and parts are being made of new materials and material combinations. This necessitates the use of technologies that are ideally matched to greatly varying deburring requirements and ensure good process reliability. Otherwise, product quality and economic efficiency suffer.

Reducing Costs by Predicting and Minimizing Burrs

Machined workpieces often include areas that must be deburred yet are also difficult to access, such as undercuts, grooves, slots, internal holes, and holes that cross through each other. The more complex the workpiece becomes, the more difficult it is to get at the burrs. Nevertheless, it’s crucial to remove burrs reliably in accordance with the specified requirements and without adversely affecting the material. Another challenge is presented by so-called secondary burrs, which are caused by the deburring tool during the deburring process.

A model developed by Dr. Beier-Entgrattechnik that is used to predict and minimize burrs makes a significant contribution to reliable, efficient deburring of workpieces made of steel and nonferrous metals. The Beier-Entgrattechnik model was developed on the basis of a metal-forming approach for the formation of burrs as a practical application. The goal is to provide production planning and design engineering with a tool based on a quick and practical means for predicting the formation of burrs in order to optimize processes and make them more efficient. The model incorporates findings from materials science and an engineering viewpoint of the machining and forming processes. The formation of burrs depends primarily on the material’s stress-strain behavior and the prevailing cutting forces. Elastic and plastic material characteristics are derived from the results of tensile tests. The determination or specification of cutting forces is based on relationships prevailing in the field of machining technology.

High-Speed Deburring: A Question of the Right Tool

In the case of machined workpieces that are produced in large numbers, deburring takes place at the end of the automated manufacturing process or after a sub-process. From an economic standpoint, a fully automated, high-speed deburring process that is executed directly in the machining center or in the CNC machine is the ideal solution. In order to prevent any slow-down of manufacturing processes with short cycle times and to assure uniform quality — reliable, automated, and highly effective deburring methods are required. On the other hand, the utilized tools have to be matched to the application and must ensure that the deburring results meet the specified requirements, even for complex workpieces with difficult-to-access burrs. Furthermore, no secondary burrs may be caused by the deburring process. Special high-speed deburring (HSD) tools have been developed for applica-
The cutting force required by these tools is not generated by spring elements, but rather by a pressure medium (e.g., coolant, oil, compressed air, or minimum lubrication lines), which are already available. This system has the advantage of maintaining force applied to the cutter at a constant level over a broad range of cutting tool deflection. The cutters are pressed the farthest inside a drill hole by its walls. Since there aren’t any burrs there, excessive force applied to the cutter would alter or even damage the surface and would result in unnecessary wear. HSD tools develop the most force when the cutters are open very wide, for example, at the edges of drill holes where the drill first enters or exits the material or at the edge of a cross-hole or a groove that needs to be deburred, i.e., precisely where force is actually required for deburring, and, if necessary, for the production of a chamfer. These tools permit forward and reverse deburring as well as the deburring of cross-holes, without any design changes.

All cross-holes, as well as the main hole’s point of entry and exit, can be deburred through the main hole with an HSD tool in a time-saving single work step. Different diameters of the cross-holes and any grooves or oblong holes that need to be deburred don’t play any role in this respect. At the same time, specially shaped cutters assure that the burrs aren’t just bent over or pressed into the cross-holes.

**NEW PROCESS FOR BURR-FREE, CROSSING OIL HOLES**

The new automated cross bore deburring (CBD) process developed by Heule Werkzeug AG in Switzerland is used in first applications. It’s a further development of the time-tested, modular COFA deburring tool system; in the newest generation of which, the cutter and the cutter retainer are separate. The COFA design provides for increased economic efficiency, as well as improved productivity, and is opening up a broader range of applications. Integrating the tool into the machining center or CNC machine makes it possible to produce previously deburred workpieces. No pre-adjustment of the COFA tool is required. The mechanically and accurately guided deburring cutter can be inserted or replaced manually or with a jig. Its functional principle ensures uniform, radius-shaped deburring without any second-
Where deburring is concerned, ever-stricter demands are being placed on quality, process reliability, and economic efficiency.

FOR MORE INFORMATION

To learn more about meeting the demands of the deburring process, mark October 13–15, 2015, on your calendar for the first DeburringEXPO at the Karlsruhe Exhibition Centre. Turn to page 10 in this issue for more information on the expo or visit www.deburring-expo.com.

ABOUT THE AUTHOR Doris Schulz is a journalist and founder of Schulz. Presse. Text. — a public relations agency based in Korntal, Germany, that specializes in the field of surface treatment. This article was commissioned by DeburringEXPO organizer fairXperts. She can be reached at ds@pressetextschulz.de.