# New abrasive flow machining

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According to a Chinese proverb, dripping water can wear away the hardest stone. A new industrial process proves that even metal components can be polished using a **semi-liquid paste**. It has the additional advantage of reaching otherwise inaccessible undercut areas.

Manual workers have been replaced by machines in many industrial processes. But there are still a number of complex tasks where our mechanical systems are decidedly too clumsy. The delicate tools used for extrusion of aluminium or plastic profiles are therefore often polished manually. Yet it then takes one or two days to finish the tool. A “liquid file” is able to accomplish the same work in just thirty or forty minutes.

“This finishing technique is becoming increasingly common in tool and die making,” declares Dr. Detlef Bottke of Micro Technica Technologies, a company that manufactures deburring and surface treatment technologies, and other precision machining systems. “Our customers are frequently faced with the necessity of deburring and

polishing complex-shaped three-dimensional metal surfaces with undercut areas. Conventional techniques are rarely capable of producing the desired result." The new technique uses a liquid polymer containing abrasive particles of aluminum oxide, silicon carbide, boron carbide or diamond as the grinding medium. The shape and density of particles varies according to the job in hand and the type of workpiece being processed. The granular suspension is forced through the workpiece under optimum pressure, removing or separating material from defined areas of the surface. "Unfortunately, the exact mechanism is still unknown," admits Detlef Bottke. "To improve dimensional stability on the micrometer scale and further increase the reproducibility of the process, we need to carry out more fundamental research."

The company called on the help of the Fraunhofer Institute for Production Systems and Design Technology IPK in Berlin to investigate the correlation between the properties of the workpiece and the parameters of the abrasive medium. IPK engineer Marcus Brücher relates a typical example: "As in any other grinding process, the abrasive particles wear down over the course of time. But at present it is still impossible to reliably determine the moment at which the expensive grinding medium is no longer capable of producing the desired effect. Replacing the abrasive medium too soon leads to unnecessarily high process costs – waiting too long has a negative effect on the precision of the results." By simulating the wear process, the researchers hope to develop software that is capable of reminding the user to replace the abrasive medium at the most appropriate time.

Source: Fraunhofer-Gesellschaft