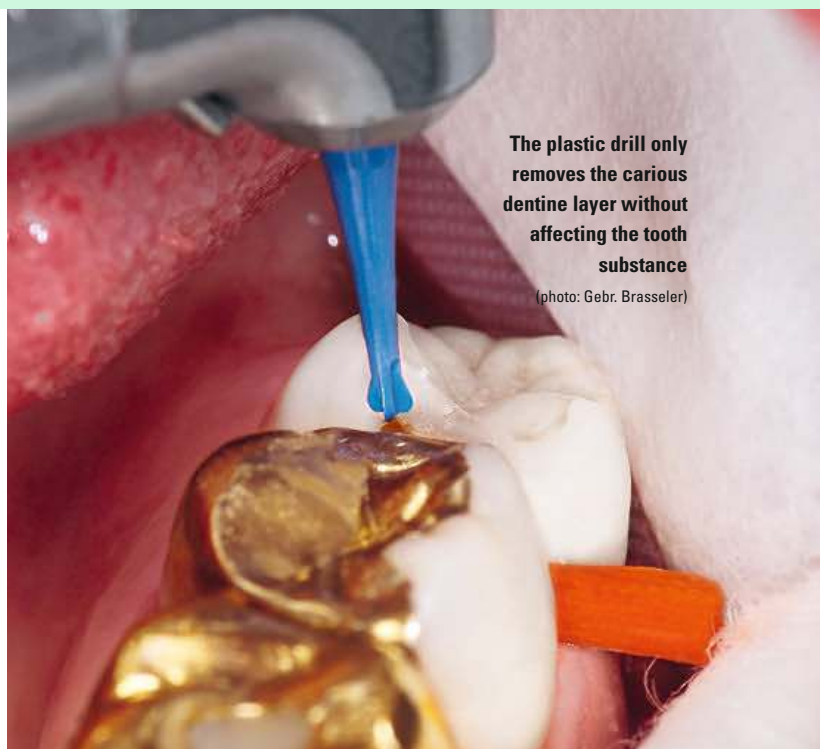


Injection Molding. There are good reasons for the drill's bad reputation, since a visit to the dentist can be painful. Now there is good news for patients: thanks to the properties of a new plastic drill, it selectively removes carious layers while leaving healthy dentine unscathed. The drill is produced ready to use in an integrated process.



The plastic drill only removes the carious dentine layer without affecting the tooth substance

(photo: Gebr. Brasseler)

The Drill Loses its Terrors

BETTINA KECK

The secret of the drill's properties lies in its material," explains Andreas Buff, technical director of Pfaff GmbH, Waldkirch, Germany. "The four PEEK cutting edges are sufficiently hard to remove the carious material, yet soft enough to be blunted upon contact with the harder dentine, leaving it intact." What Buff is talking about is a product idea of Gebr. Brasseler GmbH & Co. KG, Lemgo, Germany, a specialist in the sale of dentistry supplies, which Pfaff has realized. The new "PolyBur P1" plastic drill, which is in fact like a small milling cutter and which is sold under the trade name Komet, is used after the dental enamel has been pierced by a conventional hard-metal drill. It automatically removes only as much of the tooth as is absolutely necessary. This can, in some cases save the patient from an unpleasant root canal treatment, e.g. as a result of nerve damage.

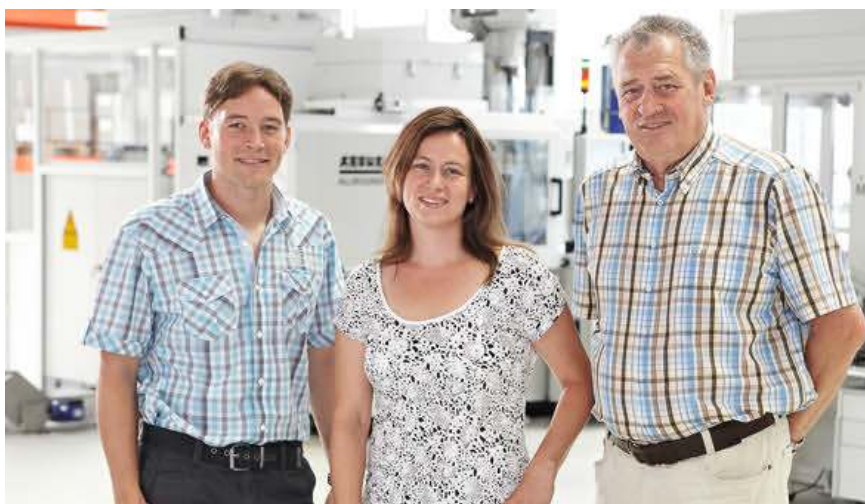
"We wanted to produce the tiny drills 'ready-to-use' as an inexpensive disposable article in a single step, dispensing

with finishing work or sterilization prior to use," explains managing director Adolf Pfaff, who founded the company in 1992. "For this purpose, we needed a high-performance precision injection molding machine and a robot capable of performing complex movements, as well as a cleanroom packaging system." Pfaff designed and implemented the complete production cell jointly with the project department from the injection molding machine manufacturer Arburg. "For us as

a small company, it is particularly important that we obtain everything from a single source and only have one contact if things don't work as they should," says Pfaff.

Packaged in a Defined Orientation in the Docked Cleanroom

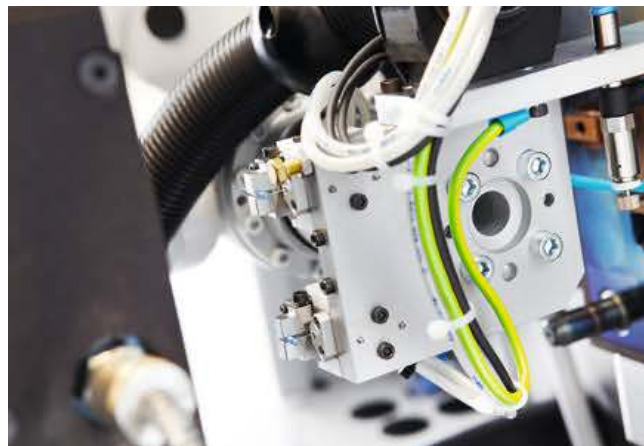
The molded parts, which weigh 0.8 g and are 22 mm long including the four delicate cutters at the tip, are produced on →



The CEOs Adolf and Corinna Pfaff, and the technical manager Andreas Buff (from right) are completely familiar with the demands of medical products

Translated from Kunststoffe 2/2013, pp. 64–66

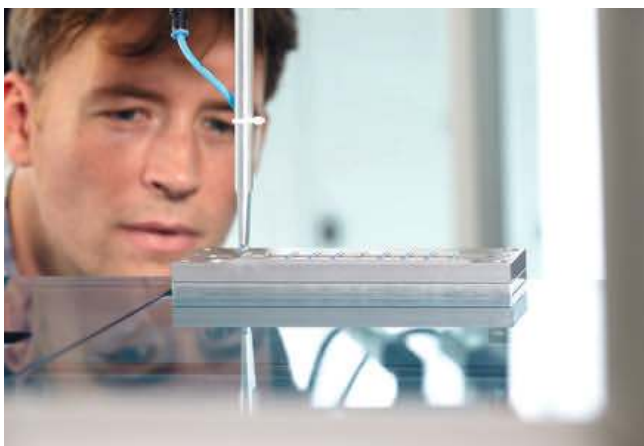
Article as PDF-File at www.kunststoffe-international.com; Document Number: PE111266



The final packaged product is produced in one step: a six-axis robot removes the drill, molded on an electrical Allrounder 370 A and transports it to the packaging unit (right in the left picture, with the blue glazing)

an electric injection molding machine (type: Allrounder 370 A) in a cycle time of approx. 25 to 30 s. "Because tolerances have to be met in the hundredth of a millimeter range, the machine must operate extremely precisely and with a high level of repeat accuracy," explains Andreas Buff. All the axes important for part quality, i.e. injection, dosage and

them down onto a cooling station. Positionally correct placement of the parts in the blister packaging then represents a real technical challenge as each drill must lie horizontally in its plastic envelope. This ensures that the dentist is always subsequently presented with the shaft of the drill when he tears open the packaging.



To allow the 22 mm-long dental drill to be packaged with the correct orientation, Andreas Buff developed a specific gripper solution

mold movements are therefore driven electrically.

At the same time, two drills are automatically packaged simultaneously with the injection molding cycle. For this task, a module meeting the ISO class 7 cleanroom requirements is docked to the machine. This module houses a six-axis robotic system (manufacturer: Kuka Roboter GmbH, Augsburg, Germany) and a packaging system (manufacturer: A&D Verpackungsmaschinenbau GmbH, Weissensberg, Germany). The high processing temperature of PEEK (390°C) facilitates production under cleanroom conditions. The robot moves to a number of positions within the room. It first removes the molded parts from the two-cavity mold and sets

In order to overcome a distance of 100 mm in the packaging system, Pfaff has developed its own gripper solution. The vacuum-operated "pistol grip" draws in the drill, which, after passing through a 160 mm tube, falls into the packaging in a defined orientation. Units comprising ten parts are then individually perforated, printed, removed via a conveyor belt before being manually packed into the final cartons.

Six-axis Robot Programming in No Time

Andreas Buff cites the integration of all the peripherals in the Selogica control system and the intuitive operation of the six-axis robotic system as significant advances:

"A service technician entered the basic settings and showed me in one evening how to handle and program the robot. The user interface is the same as for machine control – it's so easy that I can now program movement sequences myself." Adolf Pfaff adds: "A further advantage is the system's flexibility. If we receive a new order for a medical technology item, for example an insert, we can reprogram the six-axis robot ourselves in no time."

The machine is also flexible to use. Until production of the drills reaches the anticipated unit numbers, the Allrounder, which is equipped with two injection units (only one of which is active for the drill), will also be used for other tasks under cleanroom conditions. This includes, for example, the development of a spinal implant and a grant-funded project from the optical sector.

Innovative products of this kind are one of Pfaff's strengths. "When I founded the company 20 years ago, I didn't want to produce sand pit spades, but high-tech parts," chuckles Adolf Pfaff, who has decades of experience in two-component injection molding. Back in 1992, the company was already producing complex multi-component parts for the drinking water sector. Later, these were complemented with sensors, lenses and gear wheels with optical functions, as well as products for the electronics and automot-

Contact

Pfaff GmbH
→ www.pfaffgmbh.com

Arburg GmbH + Co KG
→ www.arburg.com

tive industries and, for ten years, increasingly hand-held instruments, components for probes and other medical items. Since 2011, the company has been certified according to the EN ISO 13485:2003 + AC:2009 medical standard.

Process Stability is Essential

Pfaff currently operates a total of 14 injection molding machines with clamping forces from 200 to 2,500 kN, of which six are Allrounders. “We need to rely not only on the machine technology, but also on the competence of the sales force and on rapid service,” maintains Adolf Pfaff – despite having worked as a designer for another German injection molding machine manufacturer in the past. Particularly in the medical technology sector, there are contractual obligations to ensure process reliability and adherence to delivery deadlines. “50 percent of all problems can be solved on the phone with Arburg. I only have to specify the machine number and all the relevant information is available immediately,” explains the technical director Buff.



The “PolyBur P1” PEEK drill is packaged under clean-room conditions and sold under the trade name Komet

(photos, except title photo: Arburg)

The family-run business plans to expand its production areas and has already identified its forthcoming projects. Whereas, to date, the emphasis has been on producing high-quality two-component parts, a three-component application for the hearing aid sector is currently under consideration. ■

THE AUTHORESS

DR. BETTINA KECK, born in 1968, works in corporate communications at Arburg GmbH + Co. KG, Lossburg; Germany.